EPIDEMIOLOGICAL PROFILE OF MINERAL BONE DISEASE IN CHRONIC KIDNEY DISEASE STAGE 4-5

A dissertation submitted to the Tamil Nadu Dr. M.G.R. Medical University in partial fulfillment of the University regulations for the award of D . M . (B r a n c h – I I I) (N e p h r o l o g y)

DEPARTMENT OF NEPHROLOGY
CHRISTIAN MEDICAL COLLEGE, VELLORE

BONAFIDE CERTIFICATE

This is to certify that the work presented in this dissertation titled "**EPIDEMIOLOGICAL PROFILE OF MINERAL BONE DISEASE IN CHRONIC KIDNEY DISEASE STAGE 4-5**" done towards fulfillment of the requirements of the **Tamil Nadu Dr. M.G.R. Medical University, Chennai for the D.M. (Branch–III) (Nephrology)** exams to be conducted in August 2011, is a bonafide work of the candidate **Dr. Anna T. Valson**., Senior Post graduate student in the Department of Nephrology, Christian Medical College, Vellore under my guidance and supervision. This dissertation has not been submitted, fully or in part to any other board or University.

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ACKNOWLEDGEMENT

Thanks to:

God - who gave me strength to see this through and the right people to see me through!

Prof. V Tamilarasi, HOD, Nephrology – for her guidance and encouragement throughout this thesis.

Prof. CK Jacob and Prof. GT John – for guiding me through my initial years in Nephrology, and being patient through my many failures.

Dr. Madhivanan Sundaram – who not only came up with the idea for this thesis, but provided constant intellectual and moral support, which is the main reason it got done in the first place!

Dr. Santosh Varughese and Dr. Vinoi George David – for being problem solvers, door-openers and friends.

Sr. Mercy Nahomi Deborah – who, apart from God, makes all things possible. Thank you, thank you, thank you!!!

All my consultants and colleagues in the Department – who sent me patients when I couldn't come to them.

Dr. John Roshan – who painstakingly did all the (over 500) echos and through it all also found time to enrich my world in ways both medical and spiritual.

My patients - who live with this disease and yet find a way not to be crushed by it.

My parents and sister – who have been waiting for this day a long, long, time. Thank you for unconditional love and unshakeable faith.

My husband and unquestionably better half – not enough space to say it all…..LYBYTB!

CONTENTS

ABBREVIATIONS

CKD – Chronic kidney disease

CKD-MBD – Mineral bone disease associated with chronic kidney disease

PTH – Parathyroid hormone

FGF-23- Fibroblast growth factor 23

$1,25(OH)_2D$ – 1, 25 dihydroxyvitamin D

25(OH)D – 25 hydroxyvitamin D

KDOQI – Kidney Dialysis Outcome Quality Initiative

KDIGO – Kidney Disease Impacting Global Outcome

GFR – Glomerular Filtration Rate

VDR – Vitamin D receptor

CaSR – Calcium sensing receptor

ALP – Alkaline phosphatase

CaP – Calcium- phosphorus product

HD – Haemodialysis

PD – Peritoneal dialysis

BMD – Bone mineral density

DEXA – Dual Energy X – ray absorptiometry

EBCT – Electron Beam CT

MSCT – Multi-Slice CT

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

AIM: To study the epidemiological profile i.e the clinical, biochemical and radiological parameters relating to bone mineral disease in CKD Stage 4-5

PATIENTS AND METHODS: A hospital based cross sectional survey was carried out in Stage 4-5 CKD patients, involving standard biochemical tests such as serum calcium, phosphate, PTH, 25 hydroxyvitamin D and alkaline phosphatase; imaging in the form of lateral abdominal X rays and Echocardiography to look for vascular and valvular calcification and a DEXA scan to diagnose co-existent osteoporosis.

RESULTS: Of the 710 patients enrolled, 45% had no CKD-MBD related symptom. 73.8% were hypocalcemic (< 8.5 mg%), 58.4% had serum phosphate > 4.5 mg%, 76.5% had PTH > 150 pg/mL and 87.8% had Vitamin D deficiency (< 30 ng/ml). Risk factors for Vitamin D < 15 ng/mL were diabetes, reduced sunlight exposure, BMI > 23, high socioeconomic status and female sex. Vitamin D deficiency was significantly associated with dyslipidemia (elevated total cholesterol, LDL and triglycerides). Vascular calcification was seen in 6.8% and associated with diabetes or hypertension for > 5 years, age > 50 yrs, postmenopausal status, smoking and low BMD. 78% had low BMD (T score < -1), the risk factors for osteoporosis being age > 50 yrs, amenorrhea > 1 year, Vitamin D < 15 ng/ml, low sunlight exposure and S. bicarbonate < 22 mmol/L. 51% had significant valvular calcification (Echocardiographic calcification score ≥ 5), which was associated with PTH levels < 300 pg/mL and S. calcium > 9.5 mg%.

CONCLUSIONS: In predialysis Indian CKD patients, widespread hypocalcemia and vitamin D deficiency aggravate hyperparathyroidism and are associated with low BMD and a high prevalence of valvular calcification at a young age. CKD-MBD related complications therefore require a multi-pronged treatment strategy and careful monitoring of biochemical parameters once treatment is initiated.

INTRODUCTION

Chronic kidney disease has now become an international public health problem affecting 5-10% of the world population. As renal function declines, there is a progressive impairment in the kidney's ability to regulate mineral homeostasis, leading to altered serum concentrations of calcium, phosphate, parathyroid hormone (PTH), 25 hydroxy vitamin D and fibroblast growth factor 23 (FGF-23), among others.

These changes are seen as early as CKD stage 3 (GFR< 60 ml/min/1.73m^2), when the ability of the kidney to appropriately excrete a phosphate load is diminished, leading to hyperphosphatemia. The body compensates by raising levels of PTH and FGF-23 (both of which are phosphaturic) and decreasing $1,25(OH)_2D$ (which has a net phosphate retentive role). The conversion of 25(OH) vitamin D to $1,25(OH)_2D$ which takes place in the kidney, is impaired, reducing intestinal calcium absorption, and resulting in an increase in PTH (in a bid to raise serum calcium levels). At the same time there is end organ resistance to the action of PTH and FGF-23 and downregulation of vitamin D receptors, amplifying the above changes.

The end result of these biochemical abnormalities is disordered bone growth and remodeling as well as extraskeletal calcification; these entitities now collectively known as chronic kidney disease related mineral bone disorders (CKD-MBD)

According to the KDIGO guidelines(1), **CKD-MBD is defined as:**

"A systemic disorder of mineral and bone metabolism due to CKD manifested by either one or a combination of the following:

1. Abnormalities of calcium, phosphorus, PTH, or vitamin D metabolism.

2. Abnormalities in bone turnover, mineralization, volume, linear growth, or strength.

3. Vascular or other soft-tissue calcification."

CKD-MBD is now receiving widespread attention due to the association between several aspects of CKD-MBD, namely hyperphosphatemia, hypovitaminosis D, hyperparathyroidism and vascular calcification, and the risk of cardiovascular mortality(2). The early detection and treatment of CKD-MBD therefore plays an important role in the management of patients with CKD. With the paucity of information regarding the characteristics of CKD-MBD in the Indian population, the first step, and one that this study tries to address, is to determine the characteristics of CKD-MBD in a subset of Indian predialysis patients. This information may then serve as the basis for future studies that can look into appropriate intervention strategies and their outcomes in this group of patients.

REVIEW OF LITERATURE

Chronic kidney disease (CKD) is defined by KDOQI as the presence of kidney damage (abnormalities in histopathology, urine, blood or imaging) or reduced GFR (< 60 ml/min/1.73m^2) for ≥ 3 months. The kidney plays an important role in calcium and phosphorus regulation and hence renal dysfunction is necessarily associated with abnormalities in mineral homeostasis which have wide ranging effects not only on the bone but also at extraskeletal sites, resulting in vascular or soft tissue calcification.

Normal bone remodeling

Bone remodeling is an orderly process of bone resorption and its replacement by new bone. The first step is the stimulation of osteoblast precursors derived from pluripotent mesenchymal stem cells. Parathyroid hormone (PTH) or locally produced cytokines such as IL -1 and TNF-α stimulate the release of soluble factors (macrophage colony stimulating factor, granulocyte colony stimulating factor, IL-6, IL-11) from osteoblasts which in turn stimulate proliferation and differentiation of osteoclast precursors(3)(4). Bone resorption is aided by PTH, IL-1, and TNF-α which stimulate the secretion of collagenase(5) and tissue plasminogen activator (t-PA) and inhibit collagen synthesis(6). Once extracellular matrix interactions are disrupted, chemotactic factors (osteocalcin, osteopontin etc) are released locally, and osteoclast integrins bind to specific sequences on these molecules(7)(8)(9). The bound osteoclast then forms interactions with the underlying matrix to form an 'osteoclast clear zone' which is not permeable to ions. Insertion of vacuolar ATPases and cathepsins into the plasma membrane overlying the clear zone results in matrix degradation and mineral dissolution(10).

Bone resorption increases local concentrations of calcium or cytokines in the bone matrix (e.g., TGF-β, fibroblast growth factor) leading to feedback inhibition of osteoclast activity and apoptosis(11). These same cytokines that inactivate osteoclasts, attract osteoblasts into the resorption lacunae and activate them. Bone formation is initiated, leading to osteoblast proliferation and differentiation, osteoid synthesis, mineralization of the osteoid, and gradual replacement of the newly formed 'woven' bone by 'lamellar' bone.

1. Role of PTH and Calcitriol in bone remodeling

PTH stimulates bone formation by increasing the pool of osteoblast precursors, thus increasing the laying down of bone matrix(12). Osteitis fibrosa, which is associated with high PTH levels, is therefore characterized by an increase in osteoblast numbers and new bone formation, which in turn stimulates increased bone resorption, which is why it is termed high turnover bone disease.

Calcitriol is critical for the maturation and differentiation of both osteoblasts and osteoclasts. It also upregulates the transcription of osteocalcin and osteopontin genes, which are secreted by osteoblasts at the time of mineralization(13). Impaired secretion of these matrix proteins by osteoblasts then affects matrix organization and mineralization. Calcitriol deficiency is therefore characterized by abnormal and unmineralized osteoid and a reduced bone turnover.

2. The kidney and bone mineral homeostasis

The most common type of metabolic bone disease seen in patients with CKD is high turnover bone disease which is associated with hyperparathyroidism. Hyperparathyroidism in turn is the end result of hyperphosphatemia, reduced calcitriol synthesis, changes within the

parathyroid gland and end organ resistance to PTH, all of which are established early in the course of CKD and increase with progressive renal dysfunction.

2.1 The role of phosphate retention

As the kidney fails, its ability to excrete a phosphate load diminishes, resulting in progressive increase in ambient phosphate levels. The 'trade off' hypothesis(14) states that hyperphosphatemia transiently reduces serum ionized calcium levels, which in turn triggers PTH release, resulting in a normalization of calcium and phosphorus levels (by increasing calcium reabsorption and phosphate excretion in the kidney) and a new higher set point for PTH. In this model, therefore, hyperparathyroidism is a 'trade off' for maintaining normal calcium and phosphate levels. While early studies which demonstrated an increase in PTH levels with dietary phosphate loading(15) and a reduction in PTH levels with phosphate restriction(16) seemed to support this theory, it was later noted that hypocalcemia was not always demonstrable with phosphate loading, that hypocalcemia was fairly uncommon except in advanced CKD and that calcium loading failed to suppress PTH(17). The mechanism whereby hyperphosphatemia resulted in PTH elevation is therefore unlikely to be entirely mediated through hypocalcemia.

Hyperphosphatemia inhibits calcitriol synthesis by a feedback mechanism and low calcitriol levels stimulate PTH release(18). Calcitriol supplementation has been shown to reduce hyperparathyroidism and may be one mechanism by which hyperphosphatemia and hyperparathyroidism are linked(17).

This is not all, however, since phosphate has been shown to stimulate PTH release independent of calcium and calcitriol. One mechanism is by increasing the transcription of

PTH mRNA(19) and the second is by stimulating parathyroid gland hyperplasia through TGF-α expression, which interacts with the epidermal growth factor (EGF) receptor to activate the MAP kinase pathway, leading to cyclin-1 induction and cell proliferation(20)(21).

2.2 Reduced calcitriol synthesis

The kidney is the site of calcitriol synthesis and calcitriol levels decline as renal function worsens. The inability of PTH to upregulate 1-α hydroxylase in the kidney in response to low circulating calcitriol levels, points to the presence of factors other than reduced nephron mass acting to inhibit calcitriol synthesis. These include phosphate retention and FGF-23, a putative phosphaturic hormone whose levels rise as GFR declines, both of which have been shown to inhibit 1-α hydroxylase(22). Additionally, as GFR declines, less 25 (OH) vitamin D is filtered by the glomerulus bound to vitamin D binding globulin, thus limiting its delivery to the proximal tubule to be taken up by megalin and delivered to tubular 1-α hydroxylase(23). This limitation in substrate delivery further reduces the kidney's ability to synthesize calcitriol. In renal failure associated with significant proteinuria, vitamin D binding globulin along with bound 25 (OH) vitamin D are lost in the urine, and is another mechanism for reduced substrate delivery(24). Apart from inhibition of 1-α hydroxylase activity by phosphate and FGF-23 and reduced delivery of 25 (OH) vitamin D which limit calcitriol synthesis, there is also end organ resistance to the action of calcitriol. Vitamin D receptor (VDR) expression in target organs such as the parathyroid gland is reduced(25)(26) and the ability of the VDR to interact with its response element on DNA is compromised by uraemic toxins which non specifically bind to the VDR(27).

2.3 Abnormalities within the parathyroid gland

Calcitriol inhibits PTH release by increasing intestinal absorption of calcium (thus normalizing serum calcium), by increasing VDR expression in the parathyroid gland(28), by inhibiting transcription of PTH mRNA(29) and by its effect on parathyroid cell growth(30). This last effect is mediated via induction of the cyclin dependent kinase inhibitor p21. The ability of hypocalcemia to cause PTH release from the parathyroid gland is mediated through the calcium sensing receptor (CaSR), the expression of which is also increased by calcitriol via the VDR(31). Hyperparathyroidism is characterized initially by parathyroid cell hyperplasia, which if left untreated results in monoclonal expansion of groups of parathyroid cells leading to the formation of autonomously functioning parathyroid nodules(32). Both VDR and CaSR expression within the parathyroid gland have been found to be reduced in renal failure(33)(34), which makes the gland resistant to regulation by calcitriol.

2.4 End organ resistance to PTH

The primary function of PTH is to maintain a normal serum calcium level. In renal failure, however, the ability of PTH to generate a calcemic response is blunted. The factors responsible for this resistance to PTH include hyperphosphatemia(35), low calcitriol levels(36), reduced expression of PTH receptors(37) and non specific binding of inactive PTH fragments to PTH receptors(38).

3. MINERAL BONE DISEASE IN CKD

3.1 Clinical signs and symptoms

CKD-MBD is generally asymptomatic or characterized by the presence of non-specific symptoms that are often ignored. These include bone pains, proximal muscle weakness, red

eyes, pruritus, spontaneous tendon rupture and pathological fractures. Symptoms do not help to distinguish between low and high turnover bone disease. Extraskeletal calcification manifests as necrotizing calcific arteriolopathy and calcification of heart valves and major arteries.

3.2 Classification of CKD-MBD

L – Presence of laboratory abnormalities alone

LB – Presence of laboratory abnormalities and bone disease

LC – Presence of laboratory abnormalities and calcification

LBC – Presence of aboratory abnormalities, bone disease and calcification

3.3 Biochemical abnormalities

Although examination of undecalcified bone biopsy specimens remains the gold standard for assessing bone mineral disease in CKD, its invasive nature precludes its widespread use as a diagnostic modality. Biochemical investigations therefore are the mainstay of diagnosis and serve as markers to formulate and assess treatment strategies.

3.3.1 Prevalence

Data on the prevalence of biochemical abnormalities in predialysis CKD patients is sparse because of the absence of national registries in most countries and the lack of large cohort studies. There is also heterogeneity between referred and non-referred CKD patients, further skewing data. The Study to Evaluate Early Kidney Disease(39), a large outpatient cross-sectional study involving 1800 predialysis (Stage 3-5) patients spread across 153 centres in North America, showed that calcium and phosphorus levels remained relatively normal till a

GFR of < 40 ml/min while both 25 (OH) vitamin D and PTH levels showed progressive and significant changes early in CKD. 12% of patients with GFR > 80 ml/min and 60% of those with GFR < 60 ml/min, had a PTH > 65 pg/ml. Likewise, 13% of patients with GFR > 80 ml/min/1.73m^2 and > 60% of those with GFR < 30 ml/min had low vitamin D levels (< 22 ng/ml). The Kidney Education and Evaluation Program(40) was a community based screening programme sponsored by the NKF which targeted a population at high risk for developing CKD, namely adults with GFR < 60ml/min/1.73m^2, who were either diabetic or hypertensive or had a family history of diabetes, hypertension or CKD. In the 2646 individuals screened over a 1 year period, as eGFR decreased from 60 ml/min to 30ml/min, calcium level decreased (9.55 ± 0.47 to 9.34 ± 0.62 mg/dL), phosphorus increased (3.70 ± 0.59 to 4.15 ± 0.80 mg/dL) and PTH increased (66.3 ± 36.3 to 164 ± 109 pg/mL).

3.3.2 Assessment

Calcium: Only 1% of the total body calcium is present extracellularly and measurable in the serum. Of this, 40-50% is ionized. Although monitoring ionized calcium is preferred to total serum calcium as it is physiologically active, it is expensive, not readily available and therefore not recommended for routine evaluation. Using a colorimetric assay, serum calcium levels can be measured with a fair degree of precision, the normal range being between 8.5 – 10.5 mg/dL, though these values vary from laboratory to laboratory. Since the non-ionized portion of serum calcium is bound to albumin and anions such as citrate, bicarbonate and phosphate, hypoalbuminemia will tend to underestimate total calcium and a correction factor of 0.8 mg% for every 1 g decrease in albumin below 4 g% needs to be used to arrive at the 'corrected calcium' value.

Phosphorus: Unlike calcium which is extracellular, phosphate is an intracellular anion and measured as the sum of dihydrogen phosphate and hydrogen phosphate in the serum. In this regard, the terms phosphorus and phosphate are used interchangeably. The normal range on a colorimetric assay is 2.5 – 4.5 mg%, but values are subject to diurnal and postprandial variation and hence best measured as fasting morning samples.

PTH: PTH is synthesized in the parathyroid gland as a preprohormone which undergoes progressive cleavage to form the 84 amino acid peptide which is called 'intact PTH' (iPTH). PTH undergoes further cleavage into N-terminal, C- terminal and mid-region fragments both within the parathyroid gland and in circulation, and these fragments are finally metabolized in the liver and kidney. The first generation assays to measure PTH were inaccurate as they measured both iPTH and inactive N and C terminal fragments, whose levels in the blood increase due to reduced clearance by the failing kidney. The second generation 'two-site immunoradiometric' assay (which uses two antibodies – one binding to the amino terminal and the second binding to the carboxy terminal) was initially believed to measure only the 1-84 peptide, but was later shown to also bind the C terminal 7-84 fragment (which has antagonistic effects on the bone(41)) to variable degrees depending on the assay used(42). The third generation 'biointact PTH' assay is believed to measure only the 1-84 fragment, however its cost and failure to demonstrate a convincingly better predictive value in the diagnosis of bone mineral disease(43) or correlation with other markers of bone turnover(44), has precluded its widespread use. Second generation assays are therefore most widely used, but care needs to be taken while interpreting results, which can vary depending on the type of assay, antibody specificity, type of specimen (serum, citrated sample or plasma) and method of collection (room temperature or on

ice)(45)(46). Each center must therefore standardize its procedure related to sample collection and storage and base therapeutic decisions on PTH trends rather than isolated values.

25 (OH) vitamin D: This is the sum of 25 (OH) D_2 (ercalcidiol) and 25 (OH) D_3 (calcidiol), both of which are synthesized in the liver by the action of 25-α hydroxylase on the parent compounds Vitamin D_2 (ergocalciferol) and Vitamin D_3 (cholecalciferol). While the parent compounds are lipophilic with short half lives of < 24 hours, making them difficult to measure, 25 (OH) vitamin D has a half life of 3 weeks and is thus considered the best indicator of body stores of vitamin D derived from dietary intake and skin synthesis. There are four main methods to measure 25 (OH) vitamin D. The gold standard is high performance liquid chromatography (HPLC) but is used only in research settings because it is not readily available, is costly, and requires special expertise. The radioimmunoassay (RIA) and chemiluminescence assay measure total 25 (OH) vitamin D, while the liquid chromatography – tandem mass spectrometry (LC-MS/MS) assay, like HPLC, measures the calcidiol and ercalcidiol fractions separately. Again, cost is a limiting factor. There is an 80% agreement between these assays for the measurement of vitamin D status (47), and the systematic bias towards overestimation in the non-HPLC assays can be minimized by using a single calibrator across all laboratories. At present there is no clear definition of 'vitamin D deficiency' (various studies have defined values < 10-15 ng/ml as deficiency and those > 10-15 ng/ml but < 20-30 ng/ml as insufficiency(48)(49)) and it has not been conclusively proven that supplementation of vitamin D in the CKD population offers any benefit over and above that offered by calcitriol supplementation in terms of reducing mortality(50). It is therefore important for clinicians to not only have an idea of the assay method used at their centre, but also to balance the cost of such assessment with the likely benefits that may accrue to the patient, since Vitamin D deficiency is a preventable cause for hyperparathyroidism.

Alkaline phosphatase: This enzyme, which catalyzes the removal of phosphate groups from target proteins, has several tissue specific isoenzymes, which can be separately measured by fractionation and heat inactivation. The liver and bone isoenzymes are most abundant and hence any elevation in t-ALP requires liver disease to be ruled out before it can be ascribed to bone disease. Both t-ALP and b-ALP are markers of bone turnover and are elevated in primary and secondary hyperparathyroidism, osteomalacia, Paget's disease and skeletal metastasis. While total alkaline phosphatase (t-ALP) is measured colorimetrically, the bone isoenzyme (b-ALP) is measured with an immunoradiometric assay. Total ALP is an acceptable adjunctive tool to diagnose CKD-MBD and monitor response to treatment as it is inexpensive. B-ALP, although more expensive and not readily available, can offer additional information in cases where PTH is equivocal.

Calcium-phosphorus product (CaP): The product of serum calcium and phosphorus was previously held to be an important determinant of the overall risk for extraskeletal calcification, and KDOQI guidelines recommended maintaining this value below 55 mg^2/dL^2. KDIGO, however, in its guidelines for CKD-MBD, have warned against an over-reliance on this value due to the fact that fluctuations in serum phosphorus are the main determinant of the CaP and both normal and high values of CaP have been linked to poor outcome(51)(52).

3.3.3 KDIGO Guidelines on assessment of biochemical abnormalities in CKD

1. Monitoring of calcium, phosphorus, PTH and alkaline phosphatase should begin at Stage 3 CKD in adults, and Stage 2 CKD in children.
2. 25 (OH) vitamin D measurement is optional, but if found to be deficient may be treated based on strategies appropriate to the population concerned.

3. The frequency of monitoring should be based on the stage of CKD, the extent of abnormalities present and the rate of progression of CKD. (See table below)
4. Treatment strategies should be based on individual calcium and phosphorus values rather than on the calcium-phosphorus product and should take into account the general trend rather than a single laboratory value.

Table 1: KDIGO guidelines on frequency of measuring biochemical parameters

	Stage 3	Stage 4	Stage 5
Calcium, phosphorus, ALP	6-12 months	3-16 months	1-3 months
PTH	Baseline	6-12 months	3-6 months
25 (OH) vitamin D	Baseline	Baseline	Baseline

3.3.4 Indian data

Data on biochemical abnormalities in CKD patients in India is sparse and in the predialysis population, virtually non-existent. A study in North India(53) comparing Vitamin D levels among 100 CKD patients (34 Stage 4 and 66 stage 5) with 72 controls showed hypovitaminosis D to be rampant in both the normal and CKD population (only 4% control and 1% of CKD subjects had values >30 ng/mL). 68% of control and 77% of the CKD population had vitamin D levels <15 ng/ml whereas the remaining had levels between 15-30 ng/mL. Vitamin D levels were inversely related to PTH levels. Vitamin D levels in CKD patients were not only lower than in their family members, CKD patients were also more likely to have Vitamin D levels in the severely deficient range (< 5 ng/mL).

3.4 Metabolic bone disease in CKD

The second component of CKD-MBD is the evaluation of bone disease, i.e abnormalities in bone turnover, mineralization, volume, linear growth, and strength. Turnover, mineralization, volume and growth are assessed by double tetracycline labeled bone histomorphometry. Bone strength is a composite of bone quality and bone mineral density. Bone quality is also evaluated by histomorphometry, while bone mineral density is evaluated by dual energy X-ray absorptiometry (DEXA).

3.4.1 Classification

Based on differences in bone turnover and mineralization, renal osteodystrophy has been traditionally classified as:

1. Osteitis fibrosa: High turnover with normal mineralization
2. Osteomalacia: Low turnover with abnormal (decreased) mineralization
3. Adynamic bone disease: Low turnover with normal mineralization and acellularity
4. Mixed osteodystrophy: Increased turnover with abnormal mineralization

3.4.2 Pathophysiology

Apart from the factors responsible for hyperparathyroidism mentioned previously, the following factors also play a role in the pathogenesis of bone mineral disease in CKD.

- Reduced dietary intake of calcium(54)
- Acidosis, which inhibits 1 α hydroxylase (thus reducing calcitriol synthesis) and promotes bone demineralization by buffering protons(55)(56) .

- Dialysis modality: Use of heparin during dialysis which results in osteopenia, the greater phosphate removal and dialysate calcium level, both of which predispose to adynamic bone disease in CAPD, and accumulation of β2 microglobulin with decline in renal function, which directly stimulates osteoclasts and promotes bone resorption(57)
- Vitamin D deficiency due to reduced dietary intake and reduced skin synthesis secondary to infrequent sunlight exposure and melanosis of the skin(58)
- Premature hypogonadism which is associated with lower levels of growth factors such as TGFβ and IGF-1 required for bone formation(59).

3.4.3 Assessment

Role of bone histomorphometry: Although a bone biopsy is invasive and difficult to perform, it remains the gold standard for diagnosing and classifying bone mineral disease because biochemical parameters cannot accurately predict the type of bone mineral disease and because certain pathologies such as aluminium related bone disease cannot be diagnosed without it.

Fluorochrome double tetracycline labeling:

Method: Tetracycline 250 mg thrice daily is given to the patient for 3 days (first label) and the dose is repeated after 14 days (second label). The patient is biopsied 5 days after the second label. Dairy products and aluminium containing antacids which can bind to tetracycline should be avoided for 2 hours before and after the label.

Principle: Tetracycline binds to newly formed bone at the unmineralized bone/osteoid interface, where it can be seen as a linear fluorescence. A second dose given 11-14 days after

the first dose allows the measurement of the amount of bone formed in the interval as the distance between the two fluorescent labels

Specimen processing:

- Bone piece should be intact and unfractured, with an internal diameter of at least 7.5 mm
- Ethanol (70%) is suitable for fixation, shipping, and storage. The bone should not be decalcified.

Interpretation: Parameters assessed on bone histomorphometry include:

- Static features of cortical bone
    - Cortical width (Ct.Wi): The combined thickness of both cortices
    - Cortical porosity (Ct.Po): The area occupied by intercortical holes expressed as a percentage of the total cortical area
- Static features of cancellous bone
    - Cancellous bone volume (BV/TV): The area occupied by cancellous bone expressed as a percentage of total marrow area
    - Trabecular features: thickness (Tb.Th), separation (Tb.Sp), number (Tb. N)
    - Osteoid features: Osteoid surface (OS/BS) – the percentage of cancellous surface with unmineralized osteoid; Osteoid thickness (Os.Th) – the mean thickness in μm, of the osteoid
- Dynamic features of cancellous bone
    - Activation frequency (Ac.f): This is a measure of overall remodeling activity
    - Mineralization lag time (Mlt): The time interval between osteoid formation and mineralization.

- Bone formation rate (BFR): A measure of the amount of cancellous bone volume or surface which is being replaced annually

3.4.4 Prevalence data

A systematic review of bone biopsy findings in CKD Stage 3-5 patients, carried out by KDIGO(1), revealed the following prevalence data: Osteitis fibrosa was the most common form of renal osteodystrophy (32%), followed by mixed osteodystrophy (20%) and normal histology (16%). Osteomalacia, adynamic bone disease and mild forms of osteodystrophy accounted for 8%, 18% and 6% respectively. With the initiation of dialysis, the pattern of osteodystrophy changed, with the majority (60%) of PD patients developing adynamic bone disease, and HD patients having mixed and osteitis fibrosa histologies in roughly equal amounts (32% and 34% respectively). Data on bone histomorphometry in predialysis patients in India is not available.

3.4.5 Relation between bone biopsy findings and clinical outcome

Both adynamic bone disease(60)(61) and osteomalacia(62) have been shown to be associated with an increased risk of fracture which in turn is linked to increased mortality. In addition, low turnover bone disease and adynamic disease in particular, have been linked with an increased risk of aortic(63)(64) and coronary artery calcification(65), which is exacerbated by a high calcium load.

3.4.6 Guidelines regarding indications for bone histomorphometry (KDIGO)

1. Unexplained fractures

2. Unexplained hypercalcemia or hypophosphatemia, severe bone pain, or unexplained increase in bone alkaline phosphatase activity
3. Suspected aluminum bone disease
4. Prior to parathyroidectomy
5. Prior to initiation of bisphosphonate therapy in CKD Stage 3-5

3.5 Standard X rays

Standard X rays have only 60% sensitivity and 75% specificity for the diagnosis of osteitis fibrosa(66). The recommended battery of X rays for the diagnosis of CKD-MBD include X rays of the hand (AP), shoulder, skull, lumbar spine (lateral) and pelvis (AP).

Changes in Osteitis Fibrosa: Rugger jersey spine, loss of lamina dura of the jaw, terminal acrolysis, subperiosteal resorption and periosteal new bone formation, 'pepper pot' skull.

Changes in osteomalacia: Looser's zones (areas of translucency at areas of mechanical stress where lamellar bone has been replaced by unmineralized woven bone)

3.6 Bone mineral density

A measure of bone strength is its mineral content per unit area, also known as the bone mineral density (BMD). A low BMD can be the result of a decrease in mineral content (as seen in osteomalacia) or a loss of bone volume (as seen in osteoporosis). BMD is measured by dual X-ray absorptiometry (DEXA) and quantitative CT among other modalities. It is expressed in terms of the T score, which is the BMD of the patient compared to a healthy 30 year old of the same gender and race.

3.6.1 Prevalence data: NHANES III found 28% of female patients with CKD stage 3-4 to have osteoporosis(67). BMD declines as GFR declines and predialysis patients have a higher prevalence of osteoporosis compared to age, sex and weight matched controls(68). Similar data is not available for CKD patients in India.

3.6.2 Importance of BMD: A low BMD has been conclusively shown to be associated with increased fracture risk and mortality in the normal population(69). DEXA scans have therefore become an accepted modality for screening patients who are believed to be at a high risk for developing osteoporosis, namely men and women > 65 years old, postmenopausal women, patients on long term steroids/cyclosporine/anticonvulsant therapy, patients with prior history of fragility fractures and hypogonadism.

3.6.3 DEXA scan: It uses two X-ray beams of differing energies that pass through the area of interest. Bone attenuates each X-ray to a varying degree and a collimator placed beneath the patient calculates the bone mineral content based on the degree of attenuation.

3.6.4 DEXA in CKD: Although bone mineral density has been shown to decrease with progression of CKD, unlike the general population, a decreased BMD in CKD patients does not have the same predictive value vis a vis fracture risk(70). The measurement of BMD in CKD is complicated by the presence of aortic calcification, scoliosis and degenerative changes such as vertebral osteophytes which can confound the interpretation of lumbar spine DEXA scans. DEXA cannot distinguish between changes in cortical and cancellous bone which is an important drawback in CKD, since hyperparathyroidism results primarily in cortical bone loss, while trabecular bone volume increases. Different bones in the body have varying proportions of cortical and cancellous bone and thus yield different estimations of BMD in the same

patient. For example, while the forearm bones are almost wholly cortical, the spine is 42% trabecular and the femur 25% trabecular(71). As DEXA measures BMD in only two dimensions, volumetric assessment is not possible and it systematically overestimates BMD in tall people and underestimates BMD in short people. Finally, the most important cause for increased fracture risk in CKD is abnormal underlying bone architecture, which again cannot be assessed by BMD measurement(72).

3.6.5 Quantitative CT (QCT): QCT uses CT technology to measure bone mineral content. Because of its superior resolution it is able to reliably distinguish between cortical and trabecular bone. Volumetric assessment of trabecular and cortical bone BMD is possible and it can be used at both central and peripheral sites(73). BMD measured by QCT has been found to correlate well with trabecular bone volume measured by histomorphometry of iliac crest biopsies, however it is costly and not universally available.

3.6.6 Ultra high resolution peripheral QCT: Separate three dimensional assessment of trabecular and cancellous bone, endosteal and periosteal circumferences, cortical area and thickness is possible(74). Its higher resolution allows visualization of ultrastructural characteristics as fine as trabecular thickness, number and separation.

3.6.7 Micro MRI: Offers a three dimensional visualization of ultrastructural details which can be analyzed like a bone biopsy(75).

3.6.8 KDIGO guidelines on BMD in CKD: The routine use of DEXA for evaluation of CKD-MBD in CKD Stage 4-5 is not recommended, because it cannot predict fracture risk as it does in the general population, and factors other than osteoporosis are responsible for poor bone strength in CKD.

3.7 Bone markers

3.7.1 Classification

Collagen based markers associated with bone formation

- N and C terminal propeptides of procollagen type 1: Generated by posttranslational cleavage of procollagen

Collagen based markers associated with bone resorption

- Carboxy and aminoterminal crosslinking telopeptide (generated by cleavage of pyridinoline bonds linking adjacent collagen molecules)
- Pyridinoline and deoxypyridinoline

Non collagen based bone markers associated with bone formation

- Bone specific alkaline phosphatase (secreted by osteoblasts)
- Osteocalcin
- Osteoprotegerin
- Receptor Activator for nuclear factor κB ligand (RANK-L)

Non collagen based bone markers associated with bone resorption

1. Tartrate resistant phosphatase (secreted by osteoclasts)

3.7.2 Bone markers and histology: KDIGO conducted a metanalysis of studies that looked at the correlation between bone formation rate as assessed by bone biopsy and bone markers (PTH,

b-ALP, osteocalcin and collagen cross-linking molecules). Osteocalcin and collagen cross-linking peptides had correlation coefficients ranging from 0.2 – 0.7 and 0.7- 0.9 respectively(1). However, bone markers have not been found to be good predictors of bone volume(76).

3.7.3 Bone markers and BMD: Bone markers are not useful in predicting BMD since, as mentioned previously they have not been found to correlate well with changes in bone volume and BMD itself is a poor guide to bone histology. In high turnover bone disease, which is often characterized by increased formation of new bone which is radiologically less dense, bone markers may be elevated though BMD may be reduced (new bone has a lower mineral content). On the contrary, low turnover bone disease may have a higher BMD due to a higher mineral content even though the overall bone volume has not increased.

3.7.4 Current role: In the normal population, bone markers have been used to assess response to therapy and in some studies have been shown to predict subsequent fracture risk better than serial BMD measurement(77). However, in the CKD population, their role is limited at best since, being renal excreted, their levels are likely to be non-specifically elevated. There is also no evidence that they predict fracture risk any better than b-ALP or PTH(78) and hence their routine use in the assessment of CKD-MBD is not recommended.

4. EXTRASKELETAL CALCIFICATION

4.1 Pathophysiology

Vascular smooth muscle cells (VSMCs) in the setting of diabetes, aging, inflammation or uraemic milieu, undergo phenotypic switch to osteoblast like cells due to upregulation of transcription factors such as RUNX-2 and MSX2(79). These osteoblast like cells lay down collagenous and non-collagenous proteins in the intima and media of blood vessels followed by

mineralization(80). Factors which accelerate this process include hyperphosphatemia, hypercalcemia, adynamic bone disease(81) (which prevents calcium buffering by the bone), osteitis fibrosa (which results in calcium resorption from the bone and higher ambient calcium levels) and a deficiency of inhibitors of calcification, namely fetuin-A, matrix Gla protein, pyrophosphate and osteopontin(82).

4.2 Prevalence

Valvular and vascular calcification have been shown to be strong predictors of cardiovascular risk in the normal population(83). CKD patients have been shown to have both a higher prevalence and faster progression of extraskeletal calcification. Pooled data from various studies suggest that 47–83% of predialysis patients had cardiovascular calcification on EBCT, while valvular (aortic or mitral) calcifications were present in 20–25% of 653 patients with CKD stages 3–5 in the Multi-Ethnic Study of Atherosclerosis(84).

4.3 Importance

Follow up studies in CKD patients have shown that once vascular calcification is established, it follows a progressive course, while patients who do not have calcification at baseline are unlikely to develop calcification in the future(1). In CKD patients, calcification or progression of calcification are independent risk factors for cardiovascular and all cause mortality(85)(86).

4.4 Assessment

1. **Electron beam CT (EBCT) and Multi-slice CT (MSCT):** Current gold standard for the detection and quantification of vascular calcification. Calcification is quantified in terms of coronary artery calcification (CAC) score measured in Agatston units. In an EBCT, X-

rays are produced by electrons impacting a tungsten ring and 3 mm slices are obtained at high speed from the top to the base of the heart. MSCT uses a paired X-ray source detector revolving around the patient and 2–64 simultaneous sections are obtained. The thickness of the slices varies from 1.5–0.6 mm and hence the MSCT has a higher spatial resolution when compared to EBCT.

2. **Lateral abdominal X ray**: Allows a semiquantitative estimation of aortic calcification using the aortic calcification index as described by Kaupilla et al(87), where the anterior and posterior aortic walls opposite lumbar vertebrae 1-4 are observed on a lateral abdominal X ray and scores assigned depending on the severity of calcification.
3. **Echocardiography**: Assesses aortic and mitral valvular calcification
4. **Pulse pressure and Pulse wave velocity**: As a bolus of blood is ejected through a vessel, its wall undergoes distension followed by recoil, from which the velocity of the blood flow can be calculated. As a result of vascular calcification the vessel wall becomes stiff and traveling velocity increases. PWV is therefore an indirect marker for vascular calcification.

4.5 Correlation between imaging modalities

As mentioned above, EBCT and MSCT are the gold standard. Lateral abdominal X ray (67,91%) and echocardiography (53,70%) have a reasonable sensitivity and specificity compared to CT, though pulse pressure correlated poorly(88).

4.6 Guidelines

KDIGO does not routinely recommend the screening of patients with CKD Stage 4-5 for vascular/valvular calcification because there is limited evidence to show that a reduction in

vascular calcification affords any mortality benefit. Patients with persistent hyperphosphatemia or those on the transplant waiting list, may be considered for screening. While EBCT is the gold standard for evaluation of vascular calcification, KDIGO, based on comparative studies, suggests that lateral abdominal X ray for aortic calcification, and echocardiography for valvular calcification, may be acceptable alternatives where CT is not available. KDIGO also suggests that patients found to have vascular calcification should be deemed to be at high cardiovascular risk.

5. MANAGEMENT OF CKD-MBD

5.1 Management of hyperphosphatemia

5.1.1 Evidence: Hyperphosphatemia has been associated with increased mortality and poor outcome in both pre-dialysis and dialysis patients, the last association being consistent across various countries and holding good for both haemodialysis and PD patients(89)(90). This is probably because of its epidemiological association with cardiovascular disease(91). Hyperphosphatemia has also been shown to promote and exacerbate other aspects of CKD-MBD such as hyperparathyroidism(92), low calcitriol levels(93) and vascular calcification(94). There is however, a lack of conclusive data from RCTs that lowering phosphorus levels improves clinical outcomes. Calcium-based and non-calcium containing phosphate binders did not differ in their ability to lower phosphate levels or impact patient outcomes(95), although there was a lower prevalence of hypercalcemia and higher mean PTH levels with the use of non-calcium containing binders. Sevelamer was found to retard the progression of vascular calcification in some studies, however this finding was not uniform(96).

5.1.2 Treatment options:

1. **Dietary phosphate restriction:** KDOQI recommends a dietary phosphate intake of < 800 mg/day as the first step in management of hyperphosphatemia, however phosphate restriction alone is ineffective in retarding progression of extraskeletal calcification unless combined with phosphate binders(97).
2. **Phosphate binders**

   Aluminium hydroxide was the first phosphate binder used, and to date has the highest phosphate binding capacity. However, long term use of aluminium hydroxide is associated with neurological, haematological and bone related toxicities and hence its use is generally avoided, except in patients with severe hyperphosphatemia in whom it can be used for < 2 weeks to bring down the calcium-phosphate product and avoid soft tissue calcification.

   Calcium based phosphate binders such as calcium acetate, calcium citrate and calcium carbonate have 25%, 22% and 40% elemental calcium respectively. While effective in binding phosphate, they have the potential side effects of PTH suppression and extraskeletal calcification due to calcium loading. They also cause GI side effects such as bloating and nausea. Calcium citrate is not recommended in CKD due to its ability to enhance dietary aluminium absorption.

   Sevelamer hydrochloride/carbonate: Being non-calcium containing and non absorbable, it has the potential to reduce extraskeletal calcification when compared to calcium containing phosphate binders. Sevelamer has also been shown to reduce LDL levels. The hydrochloride salt has been associated with a tendency to worsen acidosis, which is not seen with the carbonate salt. It is currently the costliest phosphate binder.

Lanthanum carbonate: Non-calcium containing binder which has a higher phosphate binding capacity than sevelamer. The long term clinical consequences of its use are not known as there is a potential for its accumulation due to GI absorption and subsequent deposition in the bone, although unlike aluminium, lanthanum induced bone toxicity has not been demonstrated(98).

3. **Dialysis:** Alternative dialysis modalities that offer more frequent, long duration sessions have been shown to result in significant reduction in serum phosphate level, with 50% of such patients not requiring phosphate binders(99). This may be an option for patients who are refractory to diet restrictions and phosphate binders or non-compliant.

5.1.3 Guidelines on management of hyperphosphatemia (KDIGO):

1. Serum phosphorus levels should be maintained within the normal range for the given laboratory
2. Dietary phosphate intake should be restricted
3. While aluminium based phosphate binders should be avoided, the use of both calcium and non calcium containing phosphate binders is appropriate and the choice of phosphate binder should be individualized based on other aspects of CKD-MBD such as the presence or absence of hypercalcemia, dyslipidemia etc.
4. For patients with persistent hyperphosphatemia despite the above, increasing the frequency and/or duration of dialysis is an acceptable option to increase phosphate removal

5.2 Maintaining calcium homeostasis

5.2.1 Evidence: There is no data to support that hypercalcemia is associated with an increase in mortality or fracture risk in CKD Stage 3-5. In dialysis patients, the upper limit of serum calcium above which the relative risk of mortality increases has not been defined, with studies reporting values anywhere between 9.5 – 11.4 mg%(89)(100). Serum calcium levels < 8.5 mg% have also been linked to an increase in mortality(101).

5.2.2 Treatment options

1. **Dietary intake:** Calcium supplementation (upto 2g/day) has been shown to reduce PTH levels, however this benefit must be weighed against the risk of extraskeletal calcification.
2. **Dialysate calcium concentration:** Although the exchangeable calcium compartment is very small, the net calcium flux during dialysis is an important determinant of calcium load in the long term. Studies in HD patients have shown that a 2.5 meq/L dialysate calcium concentration would result in a neutral calcium flux for the majority(102). Calcium flux in turn is not uniform between patients and is determined by the individual patient's ionized calcium, the frequency and duration of dialysis and the rate of ultrafiltration(103). The dialysate calcium concentration can therefore be modified based on the individual patient's needs, with a higher (3.5 meq/L) calcium bath for patients with hypocalcemia, 2.5 – 3 meq/L bath for patients with normocalcemia and a 2 meq/L calcium bath for patients with persistent hypercalcemia, adynamic bone disease or extraskeletal calcification. The risk of intradialytic hypotension and arrhythmias with low calcium dialysate needs to be kept in mind in this context(104). In PD patients, who are

exposed to dialysate for a longer period of time, the risk of hypercalcemia and adynamic bone disease is higher and it is recommended that dialysate calcium be maintained in the 2.5-3 meq/L range.

5.2.3 KDIGO Guidelines:

1. **S**erum calcium levels should be maintained within the normal range for the given laboratory (and preferably in the 8.5-9.5 mg% range as per KDOQI)
2. Dialysate calcium concentration should be individualized based on the patient's serum calcium level, though in a majority a dialysate calcium concentration between 2.5 – 3 meq/L would be optimal.
3. In patients with persistent hypercalcemia, calcium based phosphate binders, calcitriol and vitamin D supplements should be avoided

5.3 Management of hyperparathyroidism

5.3.1 Evidence: PTH values below 2 times normal and above 9 times normal have been linked with increased mortality in predialysis and post dialysis patients(105)(101), however normalizing PTH levels has not been shown to conclusively improve mortality. This paradox can be explained in part by the heterogeneity in PTH assays, end organ resistance to PTH and the poor predictive value of elevated PTH for underlying bone histology(106). The general consensus however, is to treat hyperparathyroidism due to its deleterious effects on bone histology.

5.3.2 Treatment options:

1. **Management of hyperphosphatemia and hypocalcemia**, both of which can result in hyperparathyroidism. Correction of serum calcium levels by the use of vitamin D

analogues or calcium containing phosphate binders suppresses PTH through the CaSR, while lowering phosphate levels reduces PTH by a posttranscriptional effect.

2. **Vitamin D analogues**: These include naturally occurring forms (ergocalciferol, cholecalciferol and calcitriol), synthetic vitamin D_2 analogues (paricalcitol, doxercalciferol) and synthetic vitamin D_3 analogues (alfacalcidol, falecalcitriol, maxacalcitol). Of these doxercalciferol and alfacalcidol are 1-α derivatives that require 25 hydroxylation in the liver. Vitamin D analogues have been shown to reduce PTH and other biochemical parameters of bone mineral disease with improvement in bone histomorphometry parameters(107)(108) and form the first line therapy for the management of hyperparathyroidism.
3. **Calcimimetics**: Calcimimetics like cinacalcet function as allosteric modulators of the CaSR in the parathyroid gland, which augment intracellular signaling secondary to binding of ionized calcium, resulting in an increase in intracellular calcium and inhibition of PTH release. It has no effect on intestinal or renal handling of calcium. The ability of cinacalcet to lower PTH levels without causing hypercalcemia or hyperphosphatemia(109)(110) makes it a useful tool in the management of hyperparathyroidism especially in patients who have failed a trial of vitamin D analogues due to the above side effects. Cinacalcet related side effects include hypocalcemia, nausea and vomiting.
4. **Parathyroidectomy** can be performed by ablation (local injection of alcohol or calcitriol) or surgical removal (subtotal parathyroidectomy or total parathyroidectomy with autologous reimplantation in the forearm). Ablation is usually carried out in small parathyroid glands with ≤ 2 nodular lesions that are easily accessible and is an option in

patients who are not fit for major surgery. It is not useful for ectopic glands or large nodular glands with markedly raised PTH levels, and requires expertise, as it may result in recurrent laryngeal nerve palsy. Surgical parathyroidectomy generally results in a sustained improvement in biochemical profile which is maintained for upto 5 years post surgery(111), though there is also the risk of recurrence(112) or persistent hypoparathyroidism. There are no RCTs comparing medical and surgical therapy and no evidence to suggest total parathyroidectomy and subtotal parathyroidectomy differ in their efficacy.

Indications for parathyroidectomy

1. Elevated PTH levels > 800 pg/ml associated with hypercalcemia and/or hyperphosphatemia that are refractory to medical therapy

2. Clinical signs and symptoms associated with refractory hyperparathyroidism (hypercalcemia, uncontrolled hyperphosphatemia, evidence of osteitis fibrosa cystica on bone biopsy, radiology or bone metabolic markers, enlarged and/or nodular parathyroid glands (> 500 mg), calciphylaxis, intractable pruritus, EPO resistant anaemia, severe bone pain, severe skeletal deformity, progressive calcification of blood vessels)

5.3.3 Guidelines on management of hyperparathyroidism (KDIGO)

1. The optimal PTH level for CKD Stage 3-5 is not known, but levels above the upper limit of normal should prompt evaluation for hyperphosphatemia, hypocalcemia and Vitamin D deficiency. If PTH remains elevated despite correction of the above factors, treatment with Vitamin D analogues is advised

2. In patients on dialysis, PTH levels should be maintained at 2-9 times the upper limit of normal and levels above this range should be treated with vitamin D analogues or calcimimetics or a combination. Vitamin D analogues and calcimimetics should be stopped if PTH falls below 2 times the upper limit of normal.
3. Vitamin D analogues should be stopped if patient develops hypercalcemia or hyperphosphatemia
4. Cinacalcet should be stopped if the patient develops hypocalcemia
5. In patients with hyperparathyroidism refractory to medical or pharmacological therapy, parathyroidectomy may be considered

5.4 Management of extraskeletal calcification

1. Use of non-calcium containing phosphate binders such as sevelamer has been shown to retard the progression of calcification when compared with calcium acetate(113)(109)(97). This, has however, not been shown to translate into an improvement in patient outcome(114)(115).
2. Synthetic vitamin D analogues in general, have been shown to be associated with a lower risk for progressive calcification with equivalent PTH reduction compared to calcitriol(116).
3. As calcification is part of the natural history of atherosclerosis, despite there being no evidence that statin therapy is associated with a reduction in cardiovascular events in CKD patients(117)(118), statin therapy is probably acceptable in patients with established calcification.

AIMS AND OBJECTIVES

1. To study the clinical, biochemical and radiological (vascular calcification, valvular calcification, bone mineral density) parameters relating to bone mineral disease in CKD Stage 4 and 5 patients.

2. To determine risk factors for the development of vascular/ valvular calcification and bone mineral disease in this population.

PATIENTS AND METHODS

DESIGN AND LOCATION: This hospital based cross sectional survey was conducted at the Department of Nephrology, Christian Medical College, Vellore.

PATIENTS: Stage 4 and 5 CKD patients who satisfied the following inclusion and exclusion criteria were included:

INCLUSION CRITERIA:

1. Patients with newly diagnosed Stage 4-5 CKD (based on history, eGFR of < 30 ml/min/1.73 m^2 by the abbreviated Modification of Diet in Renal Disease formula, with ultrasonographic and/or histological evidence of CKD) who:
    - Were not yet on dialysis

      or

    - Were being initiated on haemodialysis for the first time at CMC or on haemodialysis for < 1 month at the time of enrolment in the study

      or

    - Were being initiated on CAPD for the first time at CMC or on CAPD for < 1 month at the time of enrolment in the study
2. On calcium supplements/vitamin D supplements/phosphate binders for less than 3 months and with no prior history of calcimimetic use.

EXCLUSION CRITERIA:

1. Patients on dialysis (haemodialysis or CAPD) for > 1 month

2. Patients on calcium supplements, vitamin D supplements or phosphate binders for more than 3 months or any prior history of calcimimetic use.
3. History of steroid/cyclosporine or anticonvulsant use for > 3 months

DURATION: Patients attending the Nephrology OPD between November 2009 and August 2010 were included in the study.

METHODOLOGY: Patients attending Nephrology OPD and fulfilling the inclusion criteria detailed above, were selected for inclusion in the study. A detailed proforma was filled up for each patient recording their demographic data, socioeconomic status, history of symptoms suggestive of CKD-MBD, drug history with specific emphasis on phosphate binder, calcium supplement, calcimimetic and vitamin D use, dietary history, daily sunlight exposure and history and duration of dialysis. Informed consent was taken in the appropriate format. Biochemical parameters such as fasting and postprandial blood sugar, lipid profile, haemoglobin, B. urea, S. creatinine, S. bicarbonate, S. Calcium, serum albumin, phosphate, PTH, Alkaline phosphatase and 25 hydroxy vitamin D were measured. Lateral abdominal X rays for aortic calcification, echocardiography for valvular calcification, and DEXA scan of the femoral neck for bone mineral density were taken.

MEASUREMENTS:

1. ANTHROPOMETRY

Height and Weight were measured using height and weighing scales, standardized according to the specifications of the Department of Legal Metrology of the Government of India. BMI was calculated by dividing weight (in kg) by height (in meters).

2. CLINICAL BIOCHEMISTRY

Serum calcium, phosphate, bicarbonate, alkaline phosphatase, haemoglobin , blood urea, S. creatinine, Serum albumin, glucose fasting and post prandial and lipid profile were measured using automated analyzers.

iPTH was measured using the Immulite™ Indirect Chemiluminometric assay (Diagnostics Products Corporation, CA, USA). All samples were transported on ice to the laboratory and processed immediately.

Principle: This two site sandwich immunoassay uses a monoclonal mouse anti-PTH (44-84) antibody and a polyclonal goat anti-PTH (1-34) antibody conjugated to alkaline phosphatase. The unbound conjugate is removed by centrifugal wash, and a chemiluminiscent substrate, which is a phosphate ester of adamantly dioxetane is added and incubated. The substrate is hydrolyzed to an unstable intermediate which produces a sustained emission of light. The photon output measured by the luminometer is proportional to the concentration of PTH in the sample.

25 (OH) vitamin D was measured using the Elecsys Modular Analytics E170 Immunoassay System (Roche Diagnostics, GmbH, Manheim, Germany)

Principle: This is an electrochemiluminescence immunoassay (ECLIA) in which 25 (OH) vitamin D in the serum is incubated with a ruthenium labeled vitamin D antibody complex. Next,

biotin labeled 25(OH) vitamin D is added and occupies the free sites on the antibody. When electrically stimulated, ruthenium produces reactive species which emit light. The counts per second detected by the system is inversely proportional to the concentration of vitamin D in the serum.

Estimated GFR (eGFR) calculation: Patients were classified as Stage 4 or 5 CKD based on estimation of their GFR using the abbreviated MDRD (aMDRD) equation, given by:

aMDRD GFR = 186 X $(S.Cr)^{-1.154}$ X $(Age)^{-0.203}$ X (0.742 if female) X (1.210 if African American)

3. RADIOLOGICAL INVESTIGATIONS

X ray abdomen (lateral view)

Lateral abdominal X-ray to detected abdominal aortic calcification was obtained with a voltage of 70 kV according to standard protocol with the patient in standing position and the film at 100 cm distance.

Calcific lesions were looked for in the area parallel and anterior to the lumbar spine (L1- L4) and assessed separately for the anterior and posterior walls of the aorta using the midpoint of the intervertebral space above and below as the boundaries according to the method described by Kaupilla et al.(87). The anterior and posterior walls of were graded separately for calcification as follows:

0 – no calcification

1 – small, scattered calcific deposit filling less than $1/3^{rd}$ of the longitudinal wall of the aorta

2 – calcific deposit filling more than $1/3^{rd}$ but less than $2/3^{rd}$ of the longitudinal wall of the aorta

3 – $2/3^{rd}$ or more of the longitudinal wall of the aorta calcified

The following scores were then calculated:

Affected segments score: Number of individual segments of the aorta (either anterior or posterior) showing calcification. Minimum score = 0, Maximum score = 4

Anterior and posterior affected score: The number of individual aortic segments, either anterior or posterior,showing calcification. Minimum score = 0, Maximum score = 8.

Anteroposterior severity score: The scores of individual segments from the anterior and posterior wall are added up. Minimum score = 0, Maximum score = 24.

DEXA scan (Femoral neck)

***Procedure*:** Dual Emission X ray Absorptiometry (DEXA) scan of the left femoral neck was obtained using the Hologic QDR 4500C system with the patient supine and the leg internally rotated to correct femoral anteversion. The BMD, T score and Z score were recorded.

***Principle*:** The DEXA scan uses two X-ray beams of differing energies focused on the area of interest. Differential attenuation of each beam by the bone results in prolongation of transmission of the beams through a filter onto a counter to a degree proportional to the bone mineral content.

Definitions:

BMD: Bone mineral content divided by cross-sectional area of the bone and expressed as g/cm^2.

T score is obtained by comparing the patient's BMD to that of a healthy 30 year old of the same sex and ethnicity and is expressed as standard deviations above or below the accepted normal. The WHO has defined the following criteria for interpreting T scores:

Normal: T score of -1 or above

Osteopenia: T score of -1.0 to -2.5

Osteoporosis: T score of less than -2.5

Z score: Comparison of the patient's BMD with that of a normal subject of the same age, sex, and ethnicity and expressed as standard deviations above or below the accepted normal.

Echocardiography for valvular calcification

Echocardiography was carried out using a 2.5 MHz transducer, with patient in left lateral decubitus position, using the parasternal long and short axis views, by a single cardiologist who was blinded to all clinical details. Calcification was defined as the presence of echo brightness exceeding that of normal valve tissue. Semiquantitative assessment of valvular calcification was carried out using 2 separate scoring systems as described by Pressman et al(119):

a. Simplified Echocardiographic score

1. Aortic valve calcification (0 = absent, 1 = present)
2. Mitral valve or annular calcification (0 = absent, 1 = present)
3. Subvalvular apparatus calcification (0 = absent, 1 = present)
4. Restriction of either valve (0 = absent, 1 = present)

b. Main Echocardiographic score

1. Posterior annulus, by thirds (Score 0-3)

2. PML restriction (0 = absent, 1 = present)
3. Anterior annulus calcification (0 = absent, 1= present)
4. AML restriction (0 = absent, 1= present)
5. MV calcification (0 = absent, 1 = mild, 2 = > mild)
6. Subvalvular apparatus calcification (0 = absent,1 = present)
7. AV calcification (0 = absent, 1 = nodule in < 3 leaflets, 2 = nodules in 3 leaflets, non restrictive; 3 = restrictive)
8. Aortic root calcification (0 = absent,1 = present)

The cumulative main echocardiographic and simplified echocardiographic scores were obtained for each patient.

SAMPLE SIZE:

As there are no Indian studies on CKD-MBD in predialysis patients a sample size could not be arrived at. It was decided to include a minimum of 500 patients in the study.

STATISTICAL ANALYSIS:

Statistical analysis was done using SPSS v.15 and the various analytical techniques used were as follows:

Mean ± standard deviations were used for normally distributed data and median & range (min – max) was used for skewed data to avoid the outlier effect.

Significance was determined by Chi square test for categorical data and ANOVA for continuous data. Cohen's Kappa test was used to assess concordance between the two echocardiographic scoring systems.

RESULTS

PATIENT PROFILE: During the study period extending from November 2009 to August 2010, a total of 19828 patients attended Nephrology OPD of which 1122 patients belonged to CKD Stage 4 or 5 based on their aMDRD GFR. Of these, 710 patients fulfilled the criteria for inclusion in the study and were enrolled.

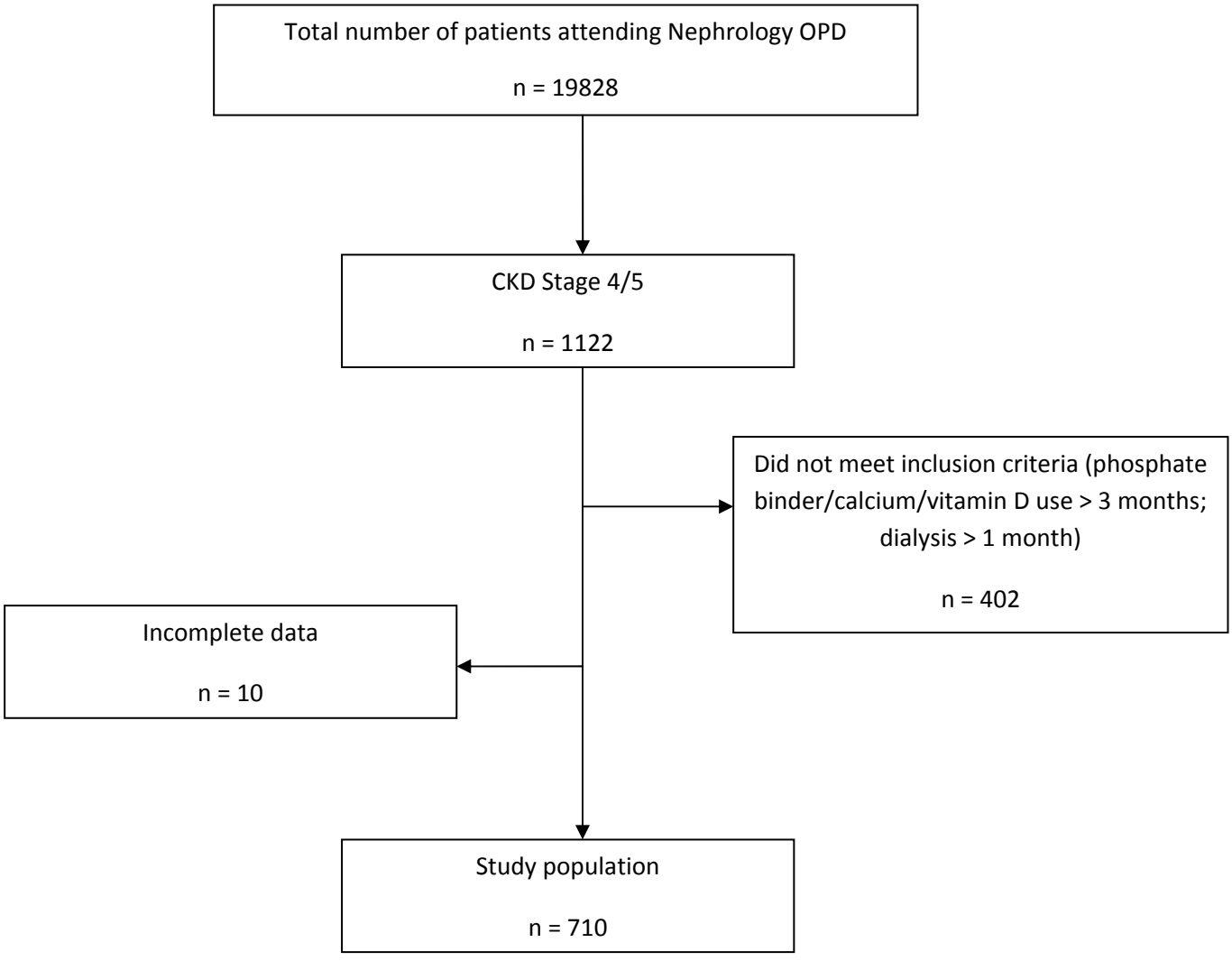

Figure 1: Case profile of the study

CLINICAL DETAILS: The study population comprised mainly adults from a middle class background with only 8 patients being less than 18 years of age. Males outnumbered females by a ratio of almost 3:1 and 36.8% of patients were diabetics. Though 68.3% belonged to CKD Stage 5, a large majority (92%) of patients had never been initiated on dialysis and of the 57 who had been dialyzed, 52 had been on dialysis for less than 2 weeks.

Table 2: Demographic profile

Study population n = 710	
Sex (Males : Females)	517: 193 (2.7:1)
Age (yrs) mean ± SD	46.6 ± 13.4
Age distribution	
< 30 (%)	104 (14.6)
30-50	293 (41.3)
>50	313 (44.1)
Socioeconomic status (%) by modified Kuppuswamy scale	
Lower class	197 (27.7)
Middle class	476 (67)
Upper class	36 (5.3)
Presence of diabetes (%)	261 (36.8)
History of dialysis (%)	
HD	55 (7.7)
PD	2 (0.3)
No history of dialysis	653 (92)
CKD Stage based on aMDRD GFR (%)	
Stage 4	225 (31.7)
Stage 5	485 (68.3)

NATIVE KIDNEY DISEASE (NKD): As the majority of patients could not be biopsied due to the presence of contracted kidneys and/or poor corticomedullary differentiation, they were labeled as unknown NKD. Diabetic nephropathy was defined as the presence of renal dysfunction associated with proteinuria and fundus changes of diabetic retinopathy. Diabetics with renal dysfunction in the absence of significant proteinuria or fundus changes were labeled as unknown NKD.

Table 3: Native kidney disease

Native kidney disease	n (%)
Unknown	413 (58.2)
Diabetic nephropathy	221 (31.1)
CIN	12 (1.7)
CGN	24 (3.4)
Obstructive nephropathy	11 (1.5)
ADPKD	16 (2..3)
Renal calculus disease	7 (1)
Arterionephrosclerosis	6 (0.8)

CKD-MBD RELATED SYMPTOMS: Patients were questioned regarding the presence of symptoms that would suggest an underlying bone mineral disease, namely: bone pains, proximal muscle weakness, paraesthesiae, pruritus, red eyes and history of pathological fractures. Although bone pain was the most common CKD-MBD related symptom found in 33.5% of study patients, 45% did not report **ANY** CKD-MBD related symptom at the time of screening.

There was no significant difference in the prevalence of CKD-MBD related symptoms between Stage 4 and 5 CKD patients.

Table 4: CKD MBD related symptoms

Symptom	Overall prevalence n (%)	Prevalence by CKD Stage		
		Stage 4 (n = 225) n (%)	Stage 5 (n = 485) n (%)	p value (intergroup)
Bone pains	238 (33.5)	71 (31.5)	167 (34.4)	0.49
Pathological fracture	3 (0.4)	1(0.4)	3(0.6)	1
Pruritus	181 (25.5)	53 (23.5)	128 (26.3)	0.45
Red eyes	0 (0)	0 (0)	0 (0)	NA
Proximal muscle weakness	186 (26.2)	48(21.3)	138 (28.4)	0.051
Paraesthesiae	6 (0.8)	1(0.4)	5(1)	0.57

DIETARY AND PERSONAL HISTORY:

Table 5: Lifestyle indices

Indices	n (%)
Smoking	112 (15.8)
Significant alcohol intake	45 (6.3)
Sun exposure in hours/day (mean ± SD)	1.9 ± 2.5

< 1 hour (%)	422 (59.4)
1-6 hours	212 (29.9)
> 6 hours	76 (10.7)
Menstrual history	
Premenopausal	96 (49.7)
Menopausal	97 (50.3)
< 5 yrs	37 (38.1)
5-10 yrs	32 (32.9)
10 yrs	28 (28.8)
Diet preference	
Vegetarian	134 (18.9)
Non vegetarian	576 (81.1)
Milk intake (ml/day)	
< 250 ml	629 (88.6)
250-500 ml	23 (3.2)
500 ml	58 (8.2)

PHOSPHATE BINDER, CALCIUM AND VITAMIN D USAGE

Patients who had used phosphate binders, calcium or vitamin D supplements for more than 3 months were excluded from the study. The cumulative calcium and calcitriol dose received and the mean duration of their use were recorded along with details of phosphate binder usage. 68.3% had never received calcitriol or calcium supplements while 79.4% had not received phosphate binders at baseline, indicating a largely treatment naïve population.

Table 6: Calcium, phosphate binder and vitamin D usage

	Mean ± SD	Range
Calcitriol cumulative dose (mg)	2.8 ± 5.6	0-30
Duration of calcitriol use (months)	0.29 ± 0.5	0-2.5
Duration of calcium use (months)	0.28 ±0.51	0-2.5
Cumulative calcium dose (g)	2.8 ± 5.6	0-37.5
Phosphate binder duration (months)	0.17 ± 0.42	0-2.5
Phosphate binder usage (%)		
Calcium acetate/carbonate	105 (14.8)	
Lanthanum	21 (3)	
Sevelamer	20 (2.8)	
None	564 (79.4)	

ANTHROPOMETRY

Height and weight measurements were used to calculate the BMI. Patients were classified according to WHO recommended BMI strata for Asians(120) as follows:

Severely underweight (< 16), moderately underweight (16-16.9), mildly underweight (17-18.49), normal (18.5-23), pre-obese (23-27.5), obesity grade I (27.5-30), obesity Grade II (30-32.5) and obesity Grade III (> 32.5).

The mean BMI was 22.4 ± 3.9 kg/m^2. Majority (83.9%) of the study population had a BMI in the normal to high range.

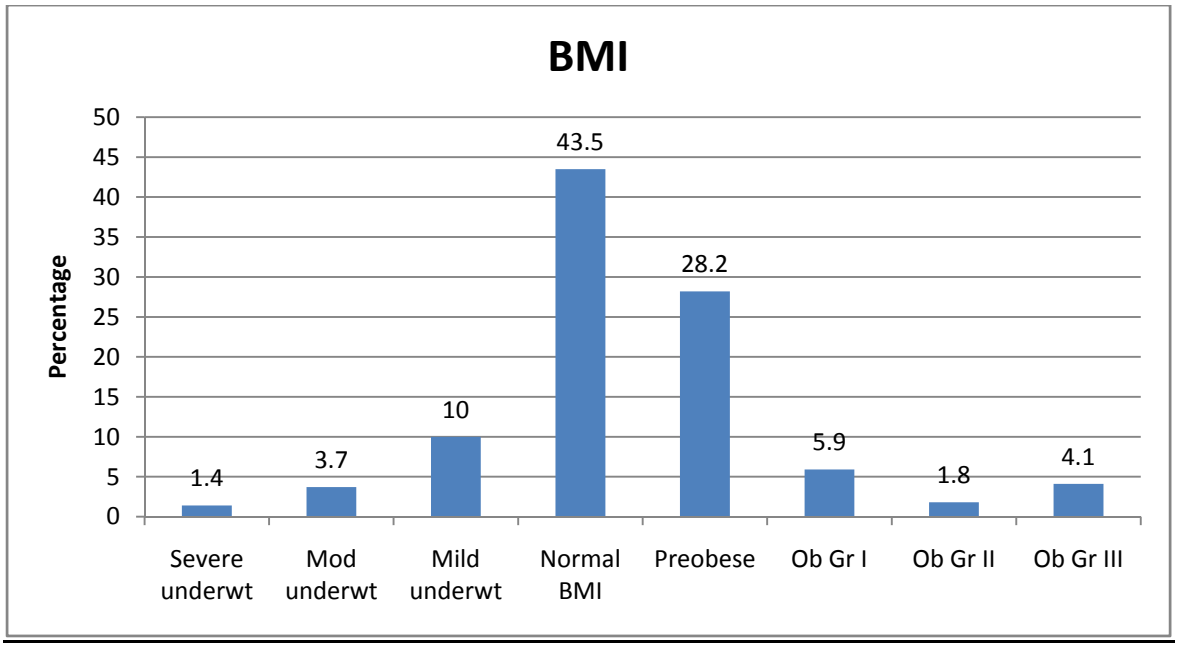

Figure 2: BMI of the study population

CLINICAL BIOCHEMISTRY

	Mean ±SD	Range
Haemoglobin (g/dL)	8.8 ± 1.9	2.6-15.9
S. cholesterol (mg/dL)	156 ± 52.7	22-553
Triglycerides (mg/dL)	134.7 ± 80.9	21-796
HDL (mg/dL)	38.1 ±12.9	14-140
LDL (mg/dL)	89.5 ±40.6	16-427
S. bicarbonate (mmol/L)	18.2 ±4.7	6-32
S. Albumin (g/dL)	3.8 ± 0.58	1.2-5.2

Table 7: Biochemical parameters

MINERAL METABOLISM

There was a significant fall in serum corrected calcium and a correspondingly significant rise in serum phosphate, calcium-phosphate product and PTH levels progressing from CKD Stage 4 to 5. Alkaline phosphatase and Vitamin D levels were not found to change significantly from Stage 4 to 5.

Table 8: Bone mineral metabolism

	Overall **Mean ±SD** **(Range)** (n = 710)	**According to CKD Stage** **Mean ±SD** **CKD Stage 4** (n = 225)	**CKD Stage 5** (n = 485)	**p value** (intergroup)
Corrected calcium (mg/dL) ; n = 700	8.0 ± 1.03 (4 - 12.4)	8.4 ± 0.6	7.8 ± 1.1	.000
S. phosphate (mg/dL) n = 700	5.3 ± 1.9 (2 – 14.6)	3.8 ± 0.77	5.9 ± 2	.000
Ca x P (mg^2/dL^2) n = 700	41.7 ± 14.5 (9 – 112)	32.6 ± 6.9	45.9 ± 15.1	.000
PTH (pg/ml) n = 627	391.1±340.19 (1.8 – 2500)	225.8 ± 204	473 ± 363.7	.000
25 (OH) Vit D (ng/ml) n = 605	20.9 ± 8.7 (3.1 ± 58.2)	21.09 ± 9.8	20.9 ± 8.2	0.845
ALP (U/L) n = 600	110.4 ± 69.22 (20.8 - 950)	107.9 ± 54.3	111.6 ± 75.4	0.543

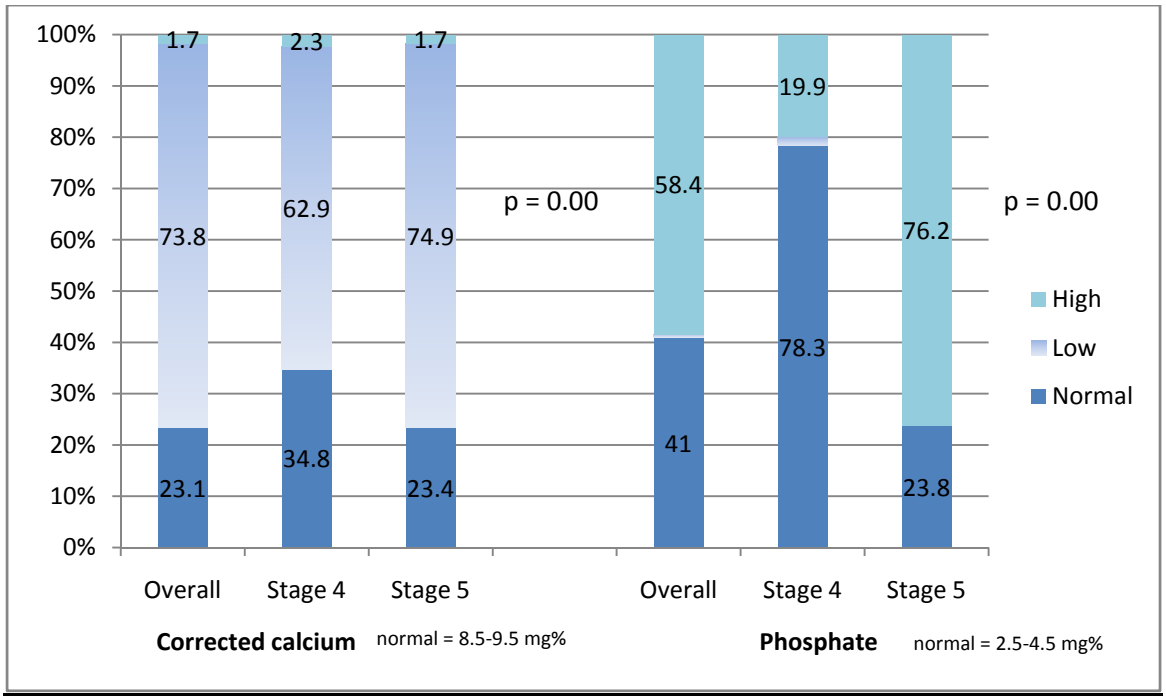

Figure 3: Calcium and phosphate levels (% of study population with normal, high and low values as per KDIGO guidelines)

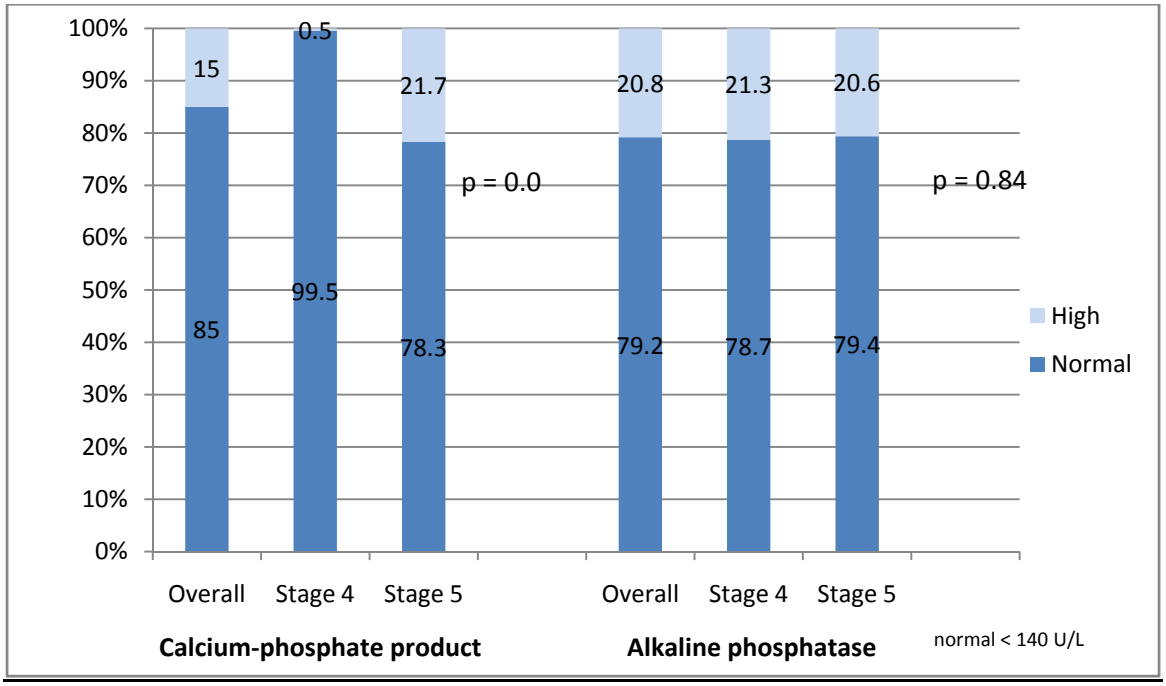

Figure 4: Calcium phosphate product and ALP levels (% of study population with high values)

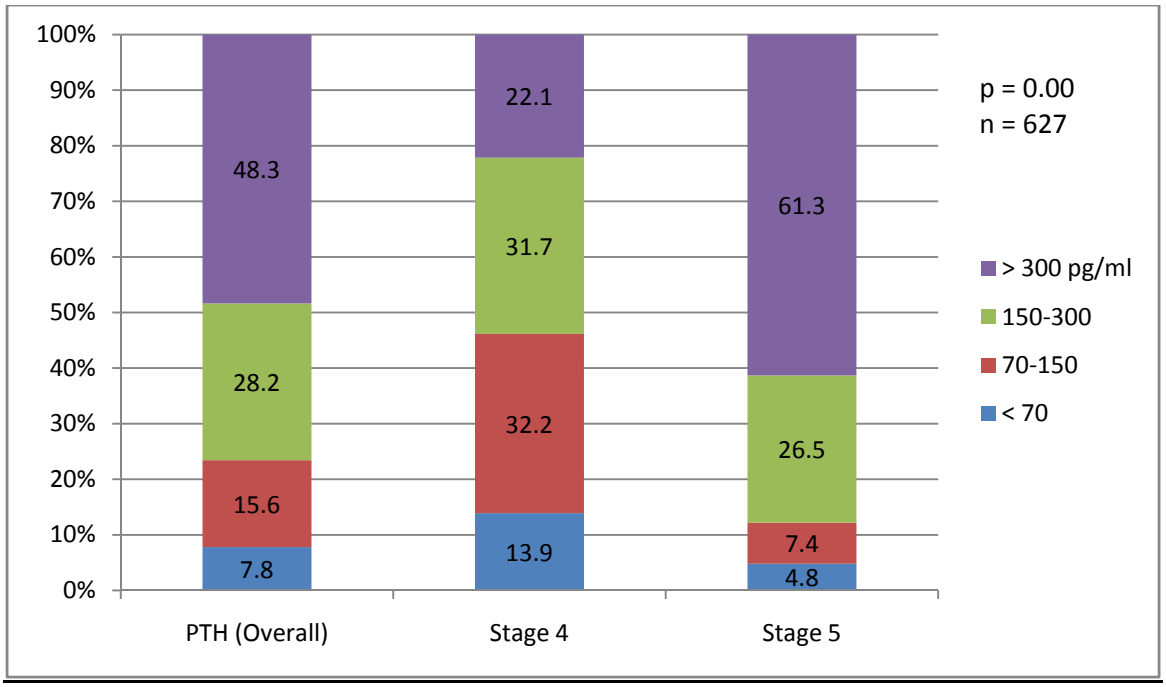

Figure 5: PTH (% of subjects with levels above KDOQI recommendations for CKD Stage)

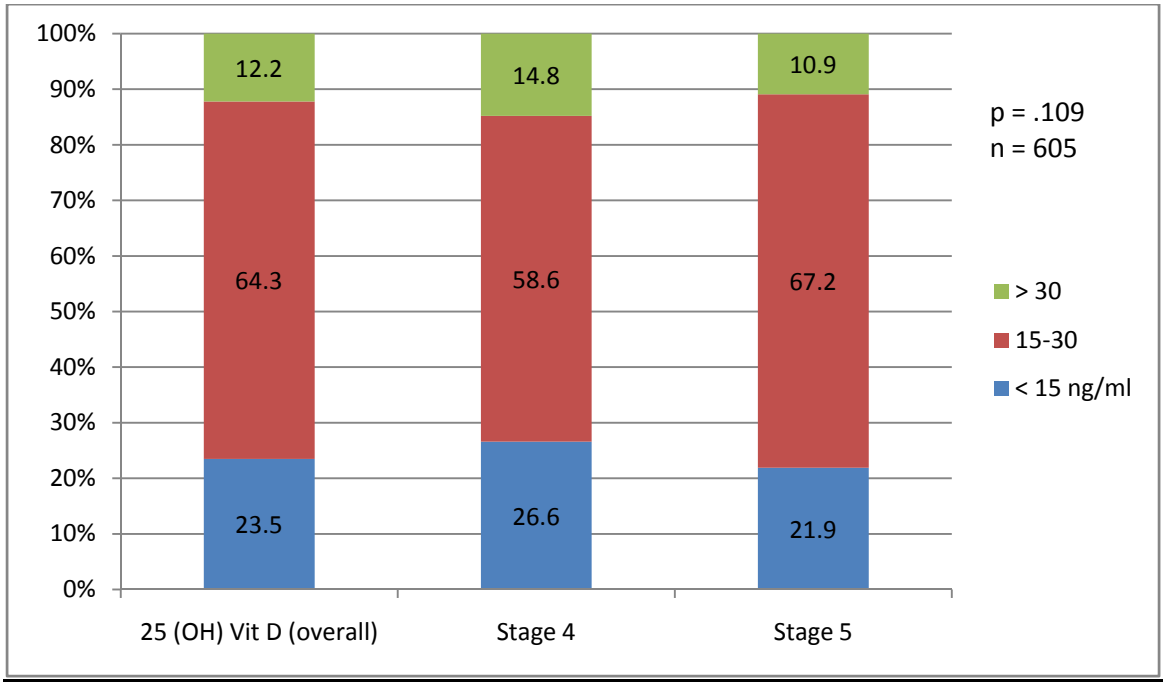

Figure 6: 25 (OH) Vitamin D (% of subjects with low and normal levels)

Overall, 73.8% were hypocalcemic (S. corrected calcium < 8.5 mg%), 58.4% were hyperphosphatemic (cut off being 4.5 mg%) and 87.8% had vitamin D levels < 30 ng/ml. 53.8% and 61.3% of Stage 4 and 5 CKD patients respectively had PTH levels that were above the KDOQI recommendations (>150 pg/ml for Stage 4, >300 pg/ml for Stage 5)

The significant clinical associations with PTH > 300 pg/ml were:

1. Age < 50 years (p = .003)
2. Diabetes < 5 years duration (p = .01)
3. Female sex (p = .009)
4. History of bone pains (p = .04)
5. Amenorrhea < 5 years (p = .01)
6. Vitamin D levels < 30 ng/ml (p = .04)

As expected, patients with PTH levels > 300 pg/ml were more likely to be anaemic,(p = .000), have S. corrected calcium <8.5 mg% (p = .000), phosphate > 4.8 mg% (p = .000), S. bicarbonate < 20 mmol/L (p = .000), elevated alkaline phosphatase (p = .000) and Calcium phosphate product > 55 mg^2/dL^2 (p = .000).

The significant clinical associations with vitamin D levels < 15 ng/ml were:

1. Duration of diabetes > 5 years (p = .000)
2. Sunlight exposure < 1 hour/day (p = .004)
3. BMI > 23 (p = .003)
4. Higher socioeconomic status (p = .003)
5. Female sex (p = .000)

The significant biochemical associations with vitamin D levels < 15 ng/ml were:

1. Hypercholesterolemia, hypertriglyceridemia, elevated LDL and non HDL cholesterol (p = .000 for each)
2. PTH > 300 pg/ml (p = .000)
3. Elevated alkaline phosphatase (p = .005)
4. S. albumin < 3.5 g% (p = .010)
5. S. corrected calcium < 8.5 mg% (p = .01)

BONE MINERAL DENSITY

Bone mineral density was measured by DEXA scan of the left femoral neck. Due to logistical reasons, DEXA scans could not be done for the majority of patients, and out of the study population of 710, reports were available only for 241 (32%). Although there was a trend towards increasing BMD with progression from Stage 4 to 5, this did not attain statistical significance. 55.1% had osteopenia and 22.9% had osteoporosis. This proportion too, did not change significantly from Stage 4 through 5. Only 2 patients had pathological fractures, both of whom had osteoporosis on DEXA scan.

Table 9: Bone mineral density

	Mean ± SD (Range) n = 241	**Stage 4 Mean ± SD** n = 78	**Stage 5 Mean ± SD** n = 163	**p value** (intergroup)
BMD (g/cm^2)	0.703 ± 0.14 (0.416 – 1.717)	0.696 ± 0.177	0.706 ± 0.133	0.63

T score	-1.664 ± 0.98 (1 to -3.9)	-1.720 ± 1.00	-1.636 ± 0.969	0.53
Z score	-1.00 ± 0.95 (-1.8 to -3.2)	-1.015 ± 0.945	-0.993 ± 0.964	0.86

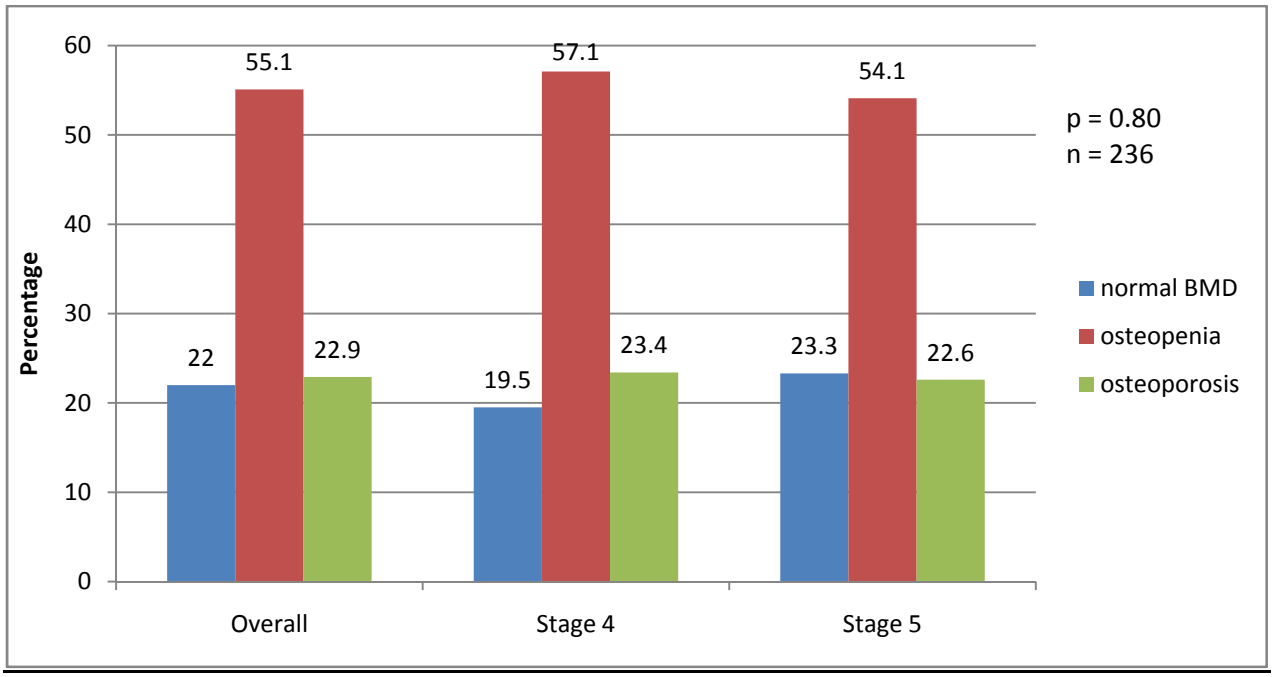

Figure 7: T score trends by CKD Stage

Factors associated with osteoporosis (T score < -2.5) were:

1. Age > 50 yrs (p = .008)
2. Postmenopausal status > 1 year (p = .000)
3. Vitamin D < 15 ng/ml (p = .006)
4. Sun exposure < 1 hour per day (p = .02)
5. Serum bicarbonate < 22 mmol/L (p = .004)

6. Vascular calcification (p = .01)

ECHOCARDIOGRAPHY

Echocardiography reports were available for 471 patients. To assess the severity of valvular calcification, two complementary scoring systems were used, as described by Pressman et al. Significant valvular calcification was defined as a Main Echocardiographic score of ≥ 5 or a Simplified Echocardiographic Score of ≥3.

On the whole, while both scoring systems showed a significant increase in the burden of valvular calcification from CKD Stage 4 to 5 (in terms of mean score), the prevalence of significant valvular calcification was not found to be different between the two groups using the Main Echocardiographic score, while the simplified echocardiographic score showed Stage 5 CKD patients to have a higher prevalence of significant valvular calcification. Thus, there was a difference in the prevalence of significant valvular calcification as assessed separately by the two scoring systems (p = .000), with Cohen's kappa showed only a 57% agreement between the two. However, as this study did not incorporate a gold standard (such as EBCT) to which each scoring system could be compared, further comparison between the two in terms of their specificity and sensitivity for assessing valvular calcification is not possible. The mitral valve and posterior mitral annulus were the most common sites for calcification.

Table 10: Valvular calcification across CKD Stage 4 and 5 using two scoring systems

n = 471	**Overall**	**Stage 4** **n = 161**	**Stage 5** **n = 310**	**p value** (intergroup)
Main Echocardiographic score				
Average score	4.5 ± 2.5	4.1 ± 2.1	4.7 ± 2.6	.021
Range	0 – 12	0 – 10	0 – 12	
Significant calcification				
Score ≥ 5	240 (51%)	76 (47.2%)	164 (52.9%)	0.24
Simplified Echocardiographic score				
Average score	2.0 ± 1.0	1.9 ± 0.9	2.1 ± 1.0	.022
Range	0 – 4	0 – 4	0 – 4	
Significant calcification				
Score ≥3	160 (34%)	42 (26.1%)	118 (38.1%)	.01
Kappa test for agreement between scoring systems (with regard to significant calcification): 0.57				

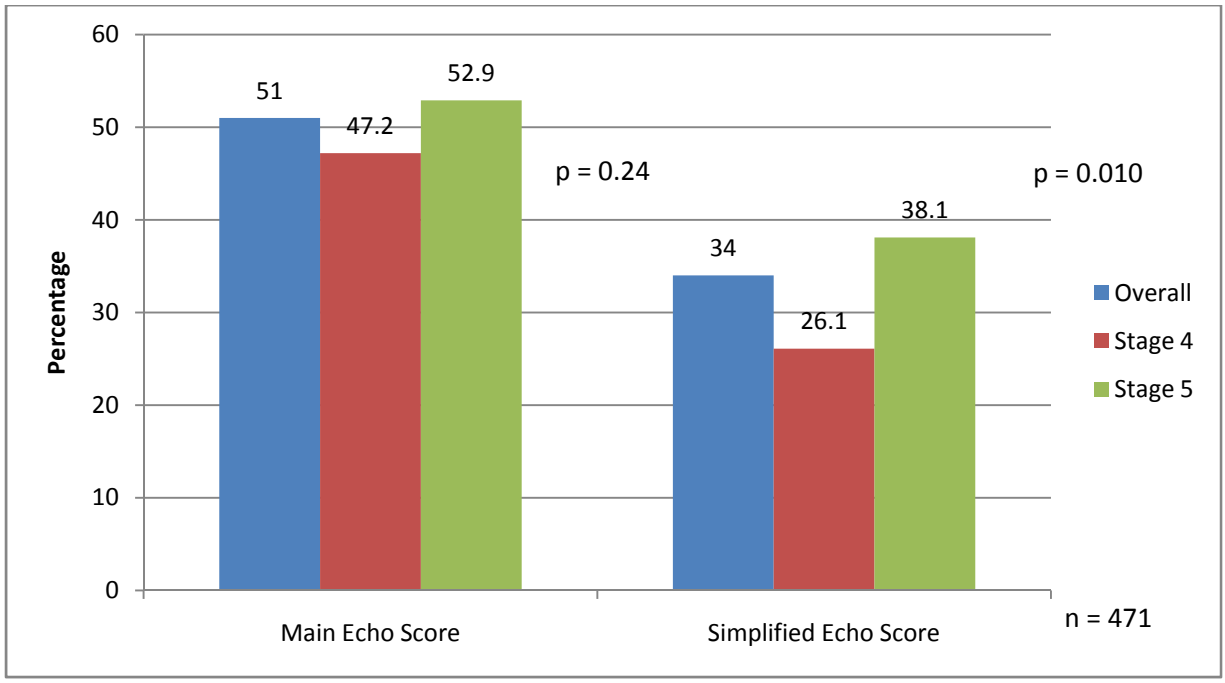

Figure 8: Prevalence of significant valvular calcification across CKD Stage 4 and 5

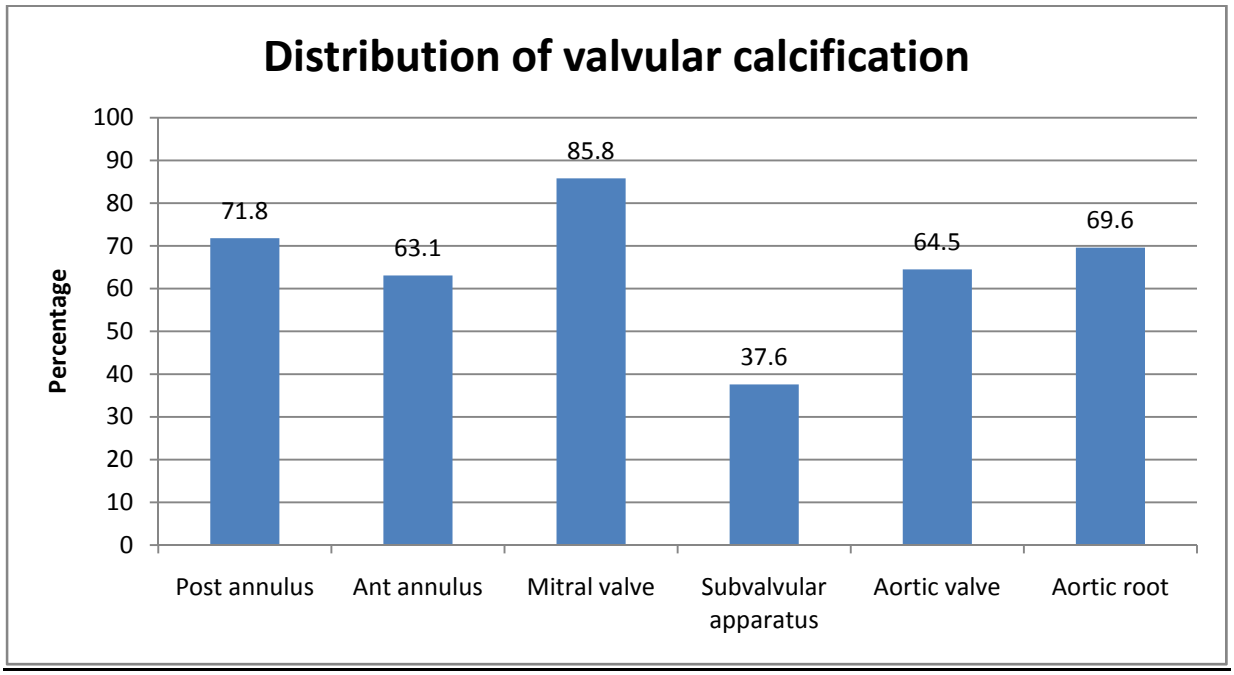

Figure 9: Distribution of valvular calcification (Main Echocardiographic score)

The predictors for valvular calcification were:

1. PTH < 300 pg/ml (p = .011)
2. S. corrected calcium > 9.5 mg% (p = .038)

There was no association between valvular calcification and age, gender, presence of diabetes, presence of hypertension, BMI, lipid profile, phosphate level, vitamin D status, history of smoking, diet preference, post menopausal status or presence/severity of aortic calcification.

VASCULAR CALCIFICATION

Lateral abdominal X-rays were taken to detect the presence of vascular calcification involving the abdominal aorta. Out of the study population of 710, lateral abdominal X-rays were available for 558 patients. Calcification of the abdominal aorta was seen in only 38 patients (6.8%). Interestingly, the prevalence of calcification was proportionately lower in Stage 5 compared to Stage 4 (5.1% vs 10%, p= .02). Also, while the mean affected segment score, anteroposterior affected segment score and anteroposterior severity score was not significantly different between Stage 4 and 5 patients with calcification, the presence of significant calcification (anterioposterior severity score ≥ 7) was significantly greater in Stage 4 CKD. Using the aortic calcification index as described by Kaupilla et al, calcification was most commonly noted in the posterior aortic wall opposite L3 and L4 (65.8 and 71.1 % respectively).

	Overall Mean ± SD (Range) n = 38	**Stage 4 CKD** Mean ± SD (Range) n = 19	**Stage 5 CKD** Mean ± SD (Range) n = 19	p value
Affected segment score (0 – 4)	2.1 ± 1 (1-4)	2.2 ± 1.1 (1-4)	2.1 ± 1 (1-4)	0.88
Anteroposterior affected score (0 – 8)	2.9 ± 1.7 (1-7)	3.1 ± 2 (1-7)	2.7 ± 1.4 (1-6)	0.527
Anteroposterior severity score (0 – 24)	4.1 ± 2.8 (1-11)	4.6 ± 3.3 (1-11)	3.6 ± 2.2 (1-8)	0.284
Significant calcification (APSS ≥7)	8 (21%)	5 (26.3%)	3 (15.8%)	.03

Table 11: Vascular calcification scores by CKD Stage

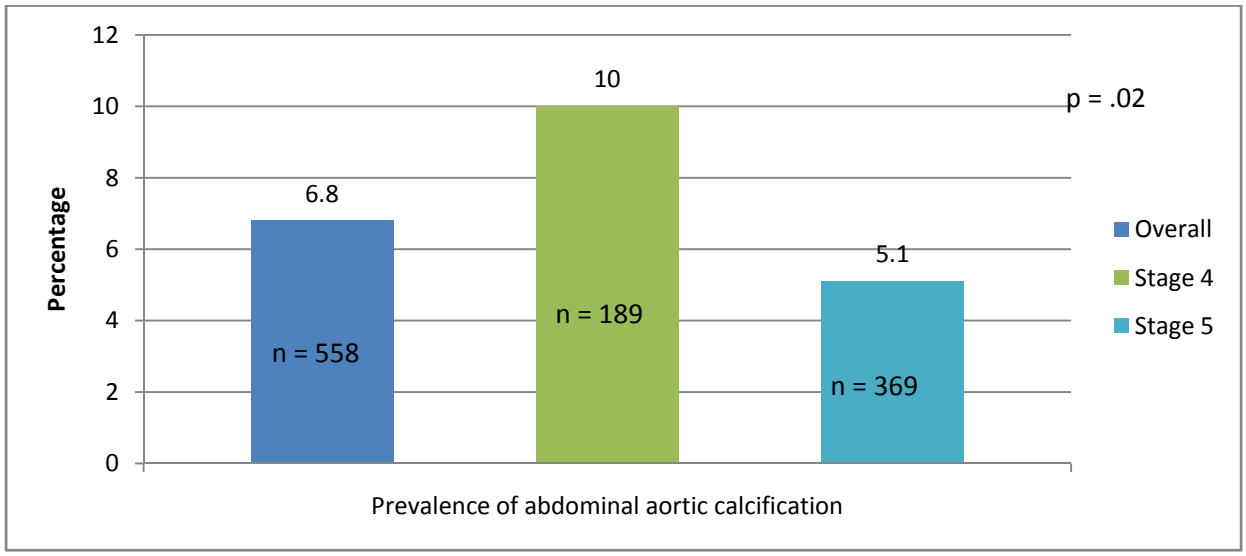

Figure 10: Prevalence of abdominal aortic calcification across CKD Stage 4 and 5

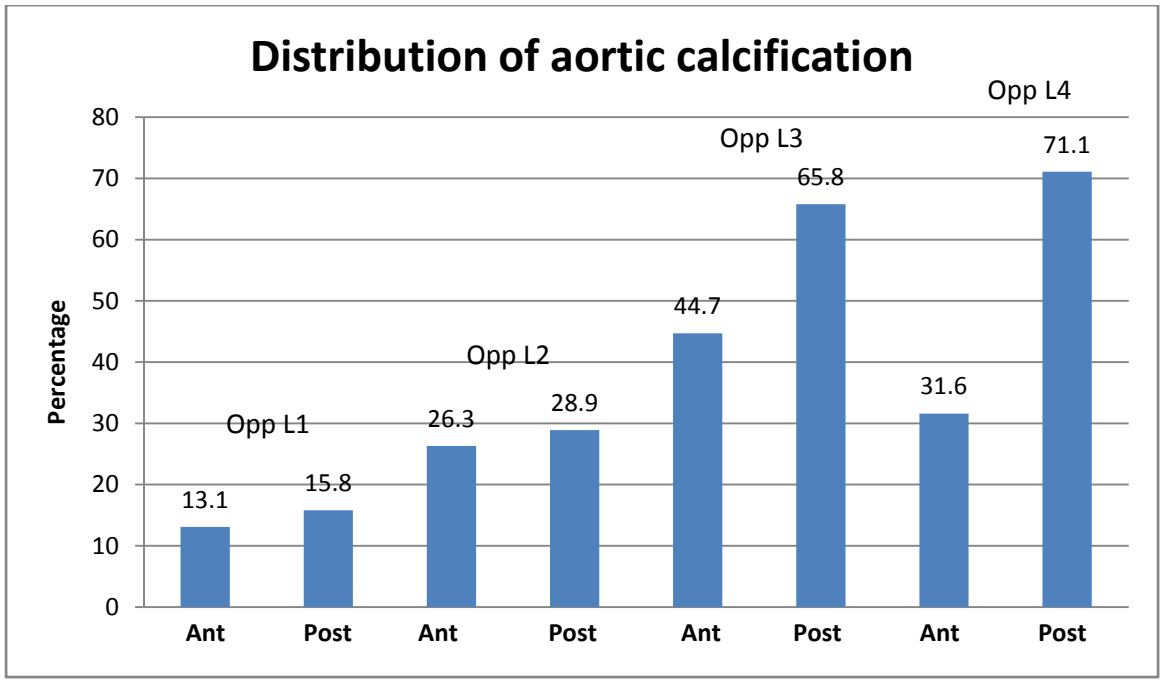

Figure 11: Distribution of abdominal aortic calcification on X ray

Predictors identified for aortic calcification were:

1. Duration of diabetes > 5 yrs (p = .000)
2. Age > 50 yrs (p = .000)
3. Duration of HT > 5 yrs (p = .000)
4. Post menopausal status > 1 yr (p = .028)
5. Smoking (p = .03)
6. Osteoporosis or osteopenia on DEXA (p = .005)
7. Serum calcium 8.5-9 mg% (p = .036), serum phosphate < 4.8 mg% (p = .02) and S. bicarbonate > 18 mmol/L (p = .022)

There was no association between aortic calcification and gender, socioeconomic status, BMI, Ca x P, PTH, vitamin D status, dyslipidemia, or presence of significant valvular calcification.

DISCUSSION

The increasing incidence and prevalence of CKD is a cause for concern worldwide. Among the aspects of CKD management, the early diagnosis and treatment of CKD related mineral bone disease is now gaining importance because of clear epidemiological links with increased all cause and cardiovascular mortality. The fact that current interventions in this area have not been consistently shown to improve patient outcomes, highlights how little we know about the pathophysiology of CKD-MBD. In India, matters are made worse by the paucity of data regarding the prevalence, nature and severity of CKD-MBD especially in the pre-dialysis population. This study sought to shed some light in this area, by collecting CKD-MBD related demographical, biochemical and imaging data in a largely pre-dialysis Indian population.

The study population comprised new outpatients categorized to Stage 4 or 5 CKD using the aMDRD formula, who presented to the Nephrology OPD at Christian Medical College, Vellore, a tertiary care center in Tamil Nadu, over a 10 month period. Patients who had received dialysis for more than a month or had been on calcium/vitamin D supplements or phosphate binders for more than 3 months, were excluded.

In this cohort of predominantly middle class patients with a mean age of 46 years, males outnumbered females 3:1, this discrepancy having more to do with an inherent social bias wherein men seek and receive medical attention more than women. 36.8% were diabetic, but the native kidney disease in at least 58% was unknown due to late referral to a nephrologist, making renal biopsy of small, shrunken or echogenic kidneys impractical. Although bone pain was the most commonly reported CKD-MBD symptom and correlated with a PTH level > 300 pg/ml, 45% of patients were totally asymptomatic, again reinforcing the fact that CKD-MBD is a silent

killer. The study design excluded patients on long term CKD-MBD related medications, nevertheless, it was disheartening that 79.4% had never been prescribed a phosphate binder and 68% had not received calcium or vitamin D supplements at any time prior to their presentation. This points to a poor knowledge among primary care physicians in India regarding the optimal management of CKD-MBD, and the need for education in this regard.

Biochemical parameters in the study were typical of a treatment naïve CKD population. The changes in mean values through Stage 4 and 5 were as follows: Serum calcium decreased from 8.4 ± 0.6 mg% to 7.8 ±1.1 mg%, serum phosphate increased from 3.8 ± 0.77 mg% to 5.9 ± 2 mg%, calcium-phosphate product increased from 32.6 ± 6.9 to 45.9 ± 15.1 mg^2/dl^2 and PTH increased from 225.8 ± 204 to 473 ± 363 pg/mL ($p = .000$ for all). Mean levels of 25 hydroxy Vitamin D and alkaline phosphatase, however did not show a significant change from Stage 4 through 5. These findings are consistent with those reported by the CKD Registry of India, which compiles data submitted from 154 centers all over India(121), and showed ALP levels to be stable from Stage 2 right through Stage 5. It is likely that alkaline phosphatase may not be a good marker of bone mineral disease and that bone alkaline phosphatase may have yielded different results, given its better correlation with bone histology and higher predictive value for differentiating between low and high turnover bone disease(1). The fact that 25 (OH) vitamin D levels did not change from Stage 4 through 5 indicates that in India, vitamin D deficiency is already established by Stage 4.

In this predialysis population, hypocalcemia was widespread (73.8%), resulting in only 15% having an elevated calcium-phosphate product. Vitamin D deficiency was also rampant, with 87.8% having levels < 30 ng/mL, 23.5% of whom had levels < 15 ng/mL. Such a high prevalence of hypocalcemia and vitamin D deficiency is unique to subcontinental CKD patients

because they reflect an amplification of established population trends. The average calcium intake in the rural and urban Indian population is 264 and 356 mg/day respectively (as against the US RDA of 800-1000 mg/day)(122). Vitamin D deficiency is also common in India, with a prevalence of 66.3% using a cutoff of 15 ng/ml, which increases to 78.3% if a cutoff of 20 ng/mL is used(123). Vitamin D deficiency in turn inhibits calcium absorption from the gut, and the high phytate content of the Indian diet reduces effective calcium absorption(122), further lowering calcium levels. Sadly, the ICMR is yet to suggest a RDA for vitamin D in Indians, the ICMR RDA for calcium is only 400 mg/day and we do not as yet have a national Vitamin D food fortification programme in place, all of which makes it unlikely that this problem will go away any time soon.

In this study, vitamin D levels < 15 ng/mL were associated with diabetes, sunlight exposure < 1 hour per day, BMI > 23, higher socioeconomic status and female sex. Patients with low vitamin D levels were also more likely to have PTH levels > 300 pg/mL, calcium levels < 8.5 mg% and elevated alkaline phosphatase, again highlighting the role of vitamin D as a reversible cause of secondary hyperparathyroidism and hypocalcemia.

The link between vitamin D, diabetes, obesity and the metabolic syndrome is an area of active research(124). Vitamin D receptors and 1-α hydroxylase have been localized to pancreatic β cells, and vitamin D deficiency has been shown to cause impaired insulin secretion in response to a glucose load. Vitamin D likely modulates insulin secretion via regulating calcium flux through the β cell, as insulin secretion is a calcium dependent process. The insulin gene promoter region has a vitamin D response element which upregulates transcription of insulin. VDRs are expressed in skeletal muscle, where they increase expression of insulin receptors and enhance glucose uptake, thus reducing insulin resistance. Vitamin D has also been shown to downregulate

transcription of NF-κB, a regulator of inflammatory cytokines implicated in insulin resistance. The relation between vitamin D and diabetogenic risk is intriguing, especially as both vitamin D deficiency and diabetes are assuming epidemic proportions in India. Early evidence suggests that combined dietary supplementation with vitamin D and calcium can improve glycemic control in those with impaired fasting glucose(125), though large scale, population based studies are required to validate this finding.

That patients from a higher socioeconomic status are more likely to have Vitamin D deficiency may seem paradoxical, but this is easily explained by the fact that they are more likely to be engaged in sedentary occupations with little exposure to sunlight, compared to labourers and farmers who comprise the lower socioeconomic strata. Low vitamin D levels in female Indian CKD patients is also not unexpected, as ICMR data reveals that, despite living in a subtropical country, 75% of females in India have less than 1 hour of sunlight exposure per day. Most are housewives confined to their homes, and have a diet inadequate in calcium or vitamin D. The importance of sunlight exposure to achieving adequate vitamin D levels is highlighted by the fact that due to darker skin, Indians require longer UV exposure to achieve the same Vitamin D levels (UV radiation required to achieve minimal erythemal dose is 49-133 mJ/cm^2 in Indians compared to 31-48 mJ/cm^2 in Caucasians).(126) Also skin fibroblasts in Indians have been shown to have a higher content of 25(OH)-24 hydroxylase, which is the rate limiting enzyme for 25 (OH) vitamin D degradation(127). The association of vitamin D deficiency with high BMI points to a sedentary lifestyle with little physical exercise and sunlight exposure predisposing to both obesity and low vitamin D levels. Moreover, Vitamin D being lipid soluble, its bioavailability is altered and circulating levels lower in the obese(128).

Another interesting finding in this study was the association between Vitamin D deficiency and dyslipidemia. Karhapaa et al(129) had similar findings in a Finnish population based study, where low Vitamin D levels were linked to elevated total and LDL cholesterol and hypertriglyceridemia. The association between Vitamin D deficiency and hypertriglyceridemia was also confirmed in large cross-sectional study carried out in the US by the NHANES(130). Vitamin D directly activates the peroxisome proliferator activator receptor-δ, which is involved in the regulation of fatty acid metabolism in skeletal muscle and adipose tissue(131). Vitamin D mediated changes in calcium flux modulate adipocyte metabolism, with deficiency promoting triglyceride accumulation via increased *de novo* lipogenesis from fatty acids generated by loss of the antilipolytic effect of insulin. At the other end of the spectrum, vitamin D was also associated with hypoalbuminemia, even though the majority of the study population had a normal or high BMI. CKD is a state of chronic microinflammation, and Vitamin D has been shown to reduce the levels of inflammatory cytokines such as IL-1, IL-6 and TNF-α, which reduce albumin synthesis by the liver. Supplementation with vitamin D was found to improve protein intake and albumin levels, chiefly by inhibiting TNF-α(132).

The proportion of patients with **PTH** levels above 2 times normal (the cut-off suggested by KDIGO) increased from 53.8% in Stage 4, to 87.8% in Stage 5 CKD. KDIGO accepts that the optimal PTH level in Stage 4 and 5 CKD is not known because PTH does not correlate well with bone histology in the range of 150-600 pg/ml(1). In this study, PTH levels > 300 pg/ml were associated with young age, female sex, non-diabetics, and low Vitamin D levels.

PTH levels have generally been found to be lower in diabetics, this being explained by the binding of advanced glycation end products(AGEs) to their receptor (R-AGE) in the parathyroid gland which reduces PTH release in response to hypocalcemia(133). AGEs also inhibit collagen

and osteocalcin synthesis from osteoblasts in response to calcitriol, all of which explains why diabetics are more prone to develop adynamic bone disease(134). Vitamin D deficiency causes hypocalcemia, which stimulates PTH secretion via the CaSR. While in the general population, PTH levels have been found to increase with age due to age related decline in GFR(135), this study, like others involving a purely CKD population, found old age to be associated with lower PTH levels and a higher risk of adynamic bone disease(136). It was previously proposed that females have higher PTH levels because estrogen acting via its receptors in the parathyroid gland increases PTH mRNA transcription(137). Recent studies have found the opposite to be true – i.e, estrogen inhibits PTH release, though this is not mediated via its receptors (whose very existence in the PTH gland is now in doubt) but mediated indirectly, probably via FGF-23, which acts via the MAP kinase pathway to inhibit PTH synthesis(138). Although estrogen levels have been found to be normal in the majority of women on dialysis(139), anovulatory cycles and secondary amenorrhea are common, and progressive estrogen deficiency would be expected to result in an elevation of PTH levels. Vitamin D deficiency is also more common in women, thus increasing their risk for hyperparathyroidism. With increasing age, the opposing effect of estrogen deficiency (which increases PTH levels) and age related decline in PTH synthesis, would balance out, and PTH levels would tend to fall with increasing duration of amenorrhea.

Significant valvular calcification on echocardiography was seen in 51% and 34% of the study population, using the main echocardiographic and simple echocardiographic scores respectively, which is higher than prevalence reported in Western literature. Ix(140) and Adeney(141) et al, who independently carried out subgroup analyses of Stage 3-5 CKD patients within the Multi-Ethnic Study on Atherosclerosis, found a prevalence of 20% mitral annular calcification and 25% aortic valvular calcification on EBCT/MSCT. This subgroup of patients had a mean age of

70 years, BMI of 28.5 and mean eGFR of 50 ml/min/1.73m^2 pointing to relatively mild renal dysfunction. Since the classification of patients into Stage 3-5 was based on eGFR, most patients would have fallen in this category because of their age. Our study population, however, consisted of established Stage 4 and 5 CKD patients, in whom the prevalence of valvular calcification is expected to be higher. Sharma(85) found 40% prevalence of mitral annular calcification in 140 Stage 4-5D CKD patients by echocardiography which is more in line with our findings. The KDIGO guidelines accept echocardiography as a suitable imaging modality for the screening of valvular calcification, based on a study by Bellasi(142) in which calcification of either valve detected on echocardiography had a sensitivity and specificity of 53 and 70% and a likelihood ratio of 1.79 (95% confidence interval 1.09, 2.96) for a CAC score of $\geq$ 100. This study used two global calcification scoring systems described by Pressman et al(119) to assess the distribution and severity of valvular calcification. Although these scoring systems have yet to be validated in a CKD population, the original study compared them with the CAC score as measured by CT. A main echocardiographic score of $\geq$ 5 and a simple echocardiographic score of $\geq$ 3 had positive predictive values of 60 and 62% respectively for a CAC of $\geq$400. Although the two scoring systems differed in their estimation of the prevalence of significant valvular calcification, with a kappa of 0.57, in the absence of a gold standard such as EBCT to which each could be compared, their relative sensitivity and specificity could not be assessed. The prevalence of significant valvular calcification was found to be higher in Stage 5 CKD using the simplified echocardiographic score, though this was not confirmed with the main echocardiographic score. Longitudinal data in the CKD population seems to confirm the fact that the prevalence and severity of calcification increases with progression of CKD(143).

The mitral valve and posterior mitral annulus were the most common sites of calcification in our study. While aortic valve calcification increases with age and is considered a degenerative process, mitral annular calcification is more strongly associated with abnormalities in mineral metabolism(144). In our study, significant valvular calcification was associated with PTH < 300 ng/ml and corrected calcium > 9.5 mg%. Studies in dialysis patients have confirmed the association between myocardial calcification and elevated calcium-phophorus product(144)(145), though the relation between PTH and valvular calcification has not been directly proven(145). Hypercalcemia would be expected to lower PTH levels, which could explain this association. It is for this reason that the KDIGO suggests caution in the widespread use of calcium supplements and calcium based phosphate binders which increase calcium load, and predispose to extraskeletal calcification, besides predisposing to low turnover bone disease by suppressing PTH levels. The presence of valvular calcification is associated with poor patient outcome, with 1 year all cause mortality being 57%, 40% and 15% for patients with both aortic and mitral valve calcification, either valve and neither valve calcified respectively(146). The high prevalence of significant valvular calcification in a young predialysis population without long term exposure to calcium supplements is thus, a cause for concern. This study highlights the need to closely monitor calcium and PTH in patients who have been initiated on vitamin D, calcium and phosphate binders, to keep calcium and PTH levels within the normal range, lest our treatment cause more harm than the disease itself.

Aortic calcification as assessed by lateral abdominal X- ray, was found in 6.8%. In comparison, Adeney(141) et al assessed calcification in the descending thoracic aorta using EBCT/MSCT in 439 Stage 3-5 CKD patients and found a prevalence of 49%. Toussaint(147) found a 90% prevalence rate of abdominal aortic calcification on MSCT in Stage 3-5 CKD. One explanation

for the higher prevalence in these studies is an older cohort of patients, as the mean age of participants was 71 and 64.5 yrs respectively. Unfortunately, all other studies in the predialysis population have assessed vascular calcification in medium sized muscular arteries using EBCT (with prevalence ranging from 42 - 83% in the coronary artery in Stage 3-5(148)(149) and 49% in the superficial femoral artery in Stage 4(150)), which may not be comparable with the aorta, which is a large muscular artery. Available literature has shown a higher prevalence of calcification in the coronary bed compared to the aorta(141). The differences in prevalence between our study population and those in the West may be due to 1. Poor sensitivity of the imaging modality for detecting calcification, or 2. An actual difference in the prevalence of aortic calcification between the subcontinental and Western population.

Bellasi(142) examined the correlation between the lateral abdominal X ray and EBCT measured CAC scores. Lateral abdominal X- ray calcification score of ≥ 7 had a sensitivity and specificity of 67 and 91% for CAC score of ≥ 100 Agatston units. Thus, though the lateral abdominal X-ray has a lower sensitivity, the presence of significant aortic calcification on an X-ray is strongly associated with a significant coronary calcification score. EBCT and MSCT are neither readily available nor economically viable modalities for screening in a developing country like India, a fact that the KDIGO took into consideration when it stated in its guidelines, that in situations where EBCT and MSCT are not available, the lateral abdominal X- ray is an acceptable modality for screening for vascular calcification.

Can the lower prevalence of aortic calcification be explained by differences in prevalent risk factors for calcification between the predialysis Indian and Western populations? The known risk factors for calcification in CKD include diabetes, hyperphosphatemia, hypercalcemia, aging, inflammation and deficiency of circulating inhibitors of calcification like fetuin-A, matrix GLA

protein, pyrophosphate and osteopontin(79). The study population had a mean age of 46.6 years (56% being less than 50 years of age) and a mean BMI of 22.4, 36.8% being diabetics. Patients who had received calcium supplements, calcium based phosphate binders and vitamin D supplements for > 3 months were excluded, which may account for the low mean calcium levels of 8 mg%. In comparison, Adeney(141), Sigrist(150), Garland(149) and Toussaint(147), all of whom assessed vascular calcification in predialysis patients, had study populations with BMI of 25-31, mean age ranging from 58 – 71 years, mean serum calcium levels of 9.5 – 10.5 mg%, 20-50% diabetics and smoking prevalence of 13-55%. Thus the lower prevalence of aortic calcification in our study may be explained by the lower sensitivity of X-ray for detecting vascular calcification, and a study population which was younger, had lower BMI, lower mean calcium levels was not on long term calcium or vitamin D supplements.

The risk factors associated with presence of aortic calcification in this study were age > 50 years, duration of diabetes and/or hypertension > 5 years, smoking, postmenopausal status and low BMD on DEXA. While the first four are established risk factors for vascular calcification, the association between BMD and vascular calcification is slowly gaining recognition, with vascular calcification being independently associated with low BMD and/or risk of vertebral fractures in dialysis (151) and predialysis patients(147). DEXA is a poor modality to assess bone histomorphometry, with high turnover(152), adynamic bone disease(153) and osteomalacia(153) all being linked to low BMD. High turnover and adynamic bone disease have, however, been linked to an increased risk of calcification, though by different mechanisms(79). High turnover bone disease is associated with a high calcium-phosphate product, with hyperphosphatemia having an active role in initiating vascular smooth muscle phenotypic transformation into osteoblast like cells. Adynamic bone is unable to buffer calcium, which is then able to deposit at

areas of atherosclerosis or degenerating tissue. Postmenopausal women with osteoporosis have been shown to have a higher pulse wave velocity, which is a surrogate marker for vascular calcification(154). This risk of calcification in postmenopausal women could be a function of age and atherosclerosis due to loss of the protective effect of estrogen - pulse wave velocity has also been linked with presence of coronary atherosclerosis on CT(155) and calcification is part of the natural history of atherosclerotic plaque.

The study showed a surprising increase in risk of vascular calcification at calcium levels of 8.5 – 9 mg%, phosphate levels < 4.8 mg% and bicarbonate levels > 18. This flies against the conventional belief that vascular calcification is linked to hyperphosphatemia and hypercalcemia(141)(80). Vascular calcification can be understood as either a process of active calcification, whereby phosphate or other factors stimulate a phenotypic change in vascular smooth muscle cells leading to vascular medial calcification, or a process of active inhibition of calcification, whereby circulating factors such as fetuin A, pyrophosphate and Matrix Gla protein inhibit vascular calcification under physiological conditions. The finding that vascular calcification in this study occurred at what would be considered 'normal' levels of calcium,, phosphate and bicarbonate for a CKD patient, points to the importance of the second theory. Fetuin-A was not measured in this study, nor is there data available on Fetuin-A levels in the Indian general or CKD population, but it is obvious from this data, that it may well prove crucial to understanding vascular calcification in the Indian context and must form the basis of future research endeavors in CKD-MBD.

The higher prevalence and greater severity of calcification in Stage 4 CKD patients in the study cannot be explained, since longitudinal studies have repeatedly shown that both the prevalence and severity of calcification increases as renal function declines(143)(150). Stage 4 and 5

patients did not differ in their mean age, duration of hypertension or diabetic status, all of which were independent risk factors for calcification. How then can we explain this difference? Aortic calcification is more likely to be intimal rather than medial, since it is most commonly associated with the presence of atherosclerotic plaque. In this study, the association of diabetes, old age, hypertension, post menopausal status and smoking with aortic calcification, all of which are known risk factors for atherosclerosis, support this link. Aortic calcification has also been linked to all cause and cardiovascular mortality in the general(156) and dialysis population(86). One would hypothesize therefore, that, the presence of aortic calcification by Stage 4 CKD identifies a subgroup of patients at high risk for cardiovascular events who may not survive to reach Stage 5 CKD, thus explaining the lower prevalence of aortic calcification in Stage 5 CKD patients, Longitudinal studies in the Indian CKD population are however, required to support this theory.

Bone histomorphometry is not available at our center, and hence **DEXA** was used as a measure of bone quality in this study, with full knowledge of its poor predictive value for underlying bone histology. **Bone mineral density** as assessed by DEXA was found to be low in 78%. (55.1% were osteopenic and 22.9% osteoporotic), this proportion being consistent across Stage 4 and 5 CKD. The finding that BMD did not significantly change from Stage 4 to 5 in our study was also supported by similar studies in predialysis populations in the West(157)(158). Low BMD, therefore, is already established by Stage 4 CKD. There was actually a non-significant trend towards an increase in BMD from Stage 4 to 5 in our study, which may be due to PTH induced subperiosteal new bone formation. DEXA cannot tell cortical from cancellous bone and hence the differential actions of PTH on cortical and cancellous bone cannot be dilineated. The risk factors associated with low BMD in this study were age > 50 years, postmenopausal status > 1 yr, Vitamin D levels < 15 ng/ml, low exposure to sunlight, and acidosis. Age and

postmenopausal status are known risk factors for low BMD even in the general population. Acidosis inhibits 1-α hydroxylase, thus lowering calcitriol levels. Acidosis also leaches hydroxyapatite from the bone in the process of buffering protons, thus lowering bone mineral content(55)(56). Vitamin D is required for osteoblastic and osteoclastic differentiation, osteoid formation and mineralization, and its deficiency is therefore associated with osteomalacia and low bone mineral content. Since vitamin D is synthesized by the action of sunlight on the skin, reduced sun exposure and melanosis, both of which are common in CKD, result in low vitamin D levels, and hence low bone mineral density.

Low BMD is strongly associated with increased fracture risk in the general population. Although in CKD, the predictive value of DEXA for fracture risk is considered debatable, both patients who had pathological fractures in this study, had a T score < -2.5 on DEXA ($p = .000$). CKD patients are undoubtedly at a high risk for fractures due to poor underlying bone quality, which adds to cumulative mortality and morbidity(78). Since these bone changes begin early in CKD, the importance of timely diagnosis and appropriate management of CKD-MBD cannot be overemphasized.

The findings in this study have important implications for the management of CKD-MBD in Indian CKD patients. In Stage 4 CKD, patients have low normal calcium and normal phosphate levels due to vitamin D deficiency. PTH is generally appropriate for the degree of renal failure despite vitamin D deficiency, because of normal phosphate levels. Thus, although phosphate binders are not required in the majority of Stage 4 CKD patients, the treatment of vitamin D deficiency or marginally elevated PTH levels with Vitamin D supplements is likely to change this picture by increasing phosphate levels, which in turn will further elevate PTH levels. In Stage 5 CKD, calcium levels drop further, phosphate levels and PTH increase and vitamin D

levels remain the same. The rise in phosphate despite no change in Vitamin D levels is because of declining GFR and loss of functional nephron mass. Hyperphosphatemia in turn, causes hyperparathyroidism. The target for therapy in Stage 5 CKD, therefore, should be the judicious use of calcium based phosphate binders which would correct both hypocalcemia and hyperphosphatemia, not Vitamin D supplements, which would further increase phosphate levels. There is a caveat here, though. Once treatment is initiated, PTH, calcium and phosphate levels need to be monitored regularly, since the study also showed that the risk of valvular calcification increased at calcium levels above 9.5 mg% and PTH levels < 300 pg/mL. It would therefore be appropriate to aim for PTH levels around 150 – 300 pg/mL in Stage 4 and a little above 300 pg/mL in Stage 5, while ensuring calcium levels remained in the 8.5 – 9.5 mg% range.

BMD assessment by DEXA does not seem to add much to clinical decision making, and should therefore not be part of routine workup, given its inherent flaws. The high prevalence of valvular calcification in a predialysis population without prior exposure to calcium supplements and vitamin D, warns against blind treatment of all CKD patients with calcium and vitamin D. The presence of extraskeletal calcification in patients with otherwise normal CKD-MBD parameters is worrying, especially as indirect evidence from this study would suggest a clear mortality risk associated with its presence, and this makes a strong case for studying levels of calcification inhibitors in the Indian CKD population,

In conclusion, this study reveals a huge burden of CKD-MBD related complications well established by the pre-dialysis stage. Nephrologists in India need to be aware of the difference in CKD-MBD trends between India and the West, and adopt simple and cost effective strategies to diagnose and treat this problem.

LIMITATIONS OF THIS STUDY

1. Bone histomorphometry was not done and hence the type of osteodystrophy in these patients cannot be commented on.
2. Femoral DEXA is not the ideal modality to assess BMD in CKD patients, as forearm bones have higher cortical bone content and may reflect changes due to hyperparathyroidism better.
3. Only 32% of patients had a DEXA scan at baseline
4. We did not have a gold standard (EBCT/MSCT) to correctly assess the prevalence of valvular and vascular calcification, to which X-ray and echocardiography based prevalences could be compared. The sensitivity and specificity of the lateral abdominal X-ray and Echo to diagnose extraskeletal calcification in the Indian population therefore, remains to be determined.
5. Inflammatory markers and levels of calcification inhibitors such as fetuin-A which could have explained differences in prevalences of valvular and vascular calcification between this study and data available from the West, were not measured.

CONCLUSIONS:

1. CKD-MBD is largely asymptomatic in 45% of patients. In those who are symptomatic, bone pain is the most common symptom and is associated with serum PTH > 300 pg/ml
2. 73.8% had S. calcium levels < 8.5 mg%, 58.4% had S. phosphate > 4.5 mg%, 76.5% had PTH > 150 pg/mL and 87.8% had Vitamin D < 30 ng/ml. S. calcium declined and S. phosphate and PTH significantly increased from Stage 4 to 5.
3. ALP and Vitamin D did not significantly change from Stage 4 to 5 despite rise in PTH, suggesting that ALP may be not be a good marker of bone mineral disease in CKD.
4. Risk factors for Vitamin D < 15 ng/mL were diabetes, reduced sunlight exposure, BMI > 23, high socioeconomic status and female sex. Vitamin D deficiency was significantly associated with elevated total cholesterol, LDL, non HDL cholesterol and triglycerides.
5. Vascular calcification was seen in 6.8% and associated with diabetes or hypertension for > 5 years, age > 50 yrs, postmenopausal status, smoking, low BMD, S. calcium 8.5-9 mg%, phosphate < 4.8 mg% and S. bicarbonate > 18 mmol/L, suggesting the role of inhibitors of vascular calcification in determining the risk of vascular calcification. The prevalence of vascular calcification was significantly lower in Stage 5 compared to Stage 4 (10.1 vs 5%), and provides indirect evidence of an increased mortality risk associated with vascular calcification.
6. 78% had low BMD (T score < -1), the risk factors being age > 50 yrs, postmenopausal status of > 1 year, Vitamin D < 15 ng/mL, low sunlight exposure and S. bicarbonate < 22 mmol/L.
7. 51% had significant valvular calcification (Echocardiographic calcification score ≥ 5), which was associated with PTH levels < 300 pg/mL and S. calcium > 9.5 mg%.

BIBLIOGRAPHY

1. KDIGO clinical practice guideline for the diagnosis, evaluation, prevention, and treatment of Chronic Kidney Disease-Mineral and Bone Disorder (CKD-MBD). Kidney Int. Suppl. 2009 Aug;(113):S1-130.

2. Tentori F, Blayney MJ, Albert JM, Gillespie BW, Kerr PG, Bommer J, et al. Mortality risk for dialysis patients with different levels of serum calcium, phosphorus, and PTH: the Dialysis Outcomes and Practice Patterns Study (DOPPS). Am. J. Kidney Dis. 2008 Sep;52(3):519-530.

3. Suda T, Takahashi N, Martin TJ. Modulation of osteoclast differentiation. Endocr. Rev. 1992 Feb;13(1):66-80.

4. McSheehy PM, Chambers TJ. Osteoblast-like cells in the presence of parathyroid hormone release soluble factor that stimulates osteoclastic bone resorption. Endocrinology. 1986 Oct;119(4):1654-1659.

5. Partridge NC, Dickson CA, Kopp K, Teitelbaum SL, Crouch EC, Kahn AJ. Parathyroid hormone inhibits collagen synthesis at both ribonucleic acid and protein levels in rat osteogenic sarcoma cells. Mol. Endocrinol. 1989 Feb;3(2):232-239.

6. Hamilton JA, Lingelbach S, Partridge NC, Martin TJ. Regulation of plasminogen activator production by bone-resorbing hormones in normal and malignant osteoblasts. Endocrinology. 1985 Jun;116(6):2186-2191.

7. Ross FP, Chappel J, Alvarez JI, Sander D, Butler WT, Farach-Carson MC, et al. Interactions between the bone matrix proteins osteopontin and bone sialoprotein and the osteoclast integrin alpha v beta 3 potentiate bone resorption. J. Biol. Chem. 1993 May 5;268(13):9901-9907.

8. Miyauchi A, Alvarez J, Greenfield EM, Teti A, Grano M, Colucci S, et al. Recognition of

osteopontin and related peptides by an alpha v beta 3 integrin stimulates immediate cell signals in osteoclasts. J. Biol. Chem. 1991 Oct 25;266(30):20369-20374.

9. Reinholt FP, Hultenby K, Oldberg A, Heinegård D. Osteopontin--a possible anchor of osteoclasts to bone. Proc. Natl. Acad. Sci. U.S.A. 1990 Jun;87(12):4473-4475.

10. Blair HC, Teitelbaum SL, Ghiselli R, Gluck S. Osteoclastic bone resorption by a polarized vacuolar proton pump. Science. 1989 Aug 25;245(4920):855-857.

11. Pfeilschifter J, Seyedin SM, Mundy GR. Transforming growth factor beta inhibits bone resorption in fetal rat long bone cultures. J. Clin. Invest. 1988 Aug;82(2):680-685.

12. Watson P, Lazowski D, Han V, Fraher L, Steer B, Hodsman A. Parathyroid hormone restores bone mass and enhances osteoblast insulin-like growth factor I gene expression in ovariectomized rats. Bone. 1995 Mar;16(3):357-365.

13. Owen TA, Aronow MS, Barone LM, Bettencourt B, Stein GS, Lian JB. Pleiotropic effects of vitamin D on osteoblast gene expression are related to the proliferative and differentiated state of the bone cell phenotype: dependency upon basal levels of gene expression, duration of exposure, and bone matrix competency in normal rat osteoblast cultures. Endocrinology. 1991 Mar;128(3):1496-1504.

14. Bricker NS. On the pathogenesis of the uremic state. An exposition of the "trade-off hypothesis". N. Engl. J. Med. 1972 May 18;286(20):1093-1099.

15. Jowsey J, Reiss E, Canterbury JM. Long-term effects of high phosphate intake on parathyroid hormone levels and bone metabolism. Acta Orthop Scand. 1974;45(6):801-808.

16. Rutherford WE, Bordier P, Marie P, Hruska K, Harter H, Greenwalt A, et al. Phosphate control and 25-hydroxycholecalciferol administration in preventing experimental renal osteodystrophy in the dog. J. Clin. Invest. 1977 Aug;60(2):332-341.

17. Lopez-Hilker S, Galceran T, Chan YL, Rapp N, Martin KJ, Slatopolsky E. Hypocalcemia may not be essential for the development of secondary hyperparathyroidism in chronic renal failure. J. Clin. Invest. 1986 Oct;78(4):1097-1102.

18. Tanaka Y, Deluca HF. The control of 25-hydroxyvitamin D metabolism by inorganic phosphorus. Arch. Biochem. Biophys. 1973 Feb;154(2):566-574.

19. Sela-Brown A, Naveh-Many T, Silver J. Transcriptional and post-transcriptional regulation of PTH gene expression by vitamin D, calcium and phosphate. Miner Electrolyte Metab. 1999 Dec;25(4-6):342-344.

20. Dusso AS, Sato T, Arcidiacono MV, Alvarez-Hernandez D, Yang J, Gonzalez-Suarez I, et al. Pathogenic mechanisms for parathyroid hyperplasia. Kidney Int. Suppl. 2006 Jul;(102):S8-11.

21. Dusso AS, Pavlopoulos T, Naumovich L, Lu Y, Finch J, Brown AJ, et al. p21(WAF1) and transforming growth factor-alpha mediate dietary phosphate regulation of parathyroid cell growth. Kidney Int. 2001 Mar;59(3):855-865.

22. Perwad F, Azam N, Zhang MYH, Yamashita T, Tenenhouse HS, Portale AA. Dietary and serum phosphorus regulate fibroblast growth factor 23 expression and 1,25-dihydroxyvitamin D metabolism in mice. Endocrinology. 2005 Dec;146(12):5358-5364.

23. Nykjaer A, Dragun D, Walther D, Vorum H, Jacobsen C, Herz J, et al. An endocytic pathway essential for renal uptake and activation of the steroid 25-(OH) vitamin D3. Cell. 1999 Feb 19;96(4):507-515.

24. González EA, Sachdeva A, Oliver DA, Martin KJ. Vitamin D insufficiency and deficiency in chronic kidney disease. A single center observational study. Am. J. Nephrol. 2004 Oct;24(5):503-510.

25. Fukuda N, Tanaka H, Tominaga Y, Fukagawa M, Kurokawa K, Seino Y. Decreased 1,25-dihydroxyvitamin D3 receptor density is associated with a more severe form of parathyroid hyperplasia in chronic uremic patients. J. Clin. Invest. 1993 Sep;92(3):1436-1443.

26. Merke J, Hügel U, Zlotkowski A, Szabó A, Bommer J, Mall G, et al. Diminished parathyroid 1,25(OH)2D3 receptors in experimental uremia. Kidney Int. 1987 Sep;32(3):350-353.

27. Patel SR, Ke HQ, Vanholder R, Koenig RJ, Hsu CH. Inhibition of calcitriol receptor binding to vitamin D response elements by uremic toxins. J. Clin. Invest. 1995 Jul;96(1):50-59.

28. Naveh-Many T, Marx R, Keshet E, Pike JW, Silver J. Regulation of 1,25-dihydroxyvitamin D3 receptor gene expression by 1,25-dihydroxyvitamin D3 in the parathyroid in vivo. J. Clin. Invest. 1990 Dec;86(6):1968-1975.

29. Russell J, Lettieri D, Sherwood LM. Suppression by 1,25(OH)2D3 of transcription of the pre-proparathyroid hormone gene. Endocrinology. 1986 Dec;119(6):2864-2866.

30. Cozzolino M, Lu Y, Finch J, Slatopolsky E, Dusso AS. p21WAF1 and TGF-alpha mediate parathyroid growth arrest by vitamin D and high calcium. Kidney Int. 2001 Dec;60(6):2109-2117.

31. Brown AJ, Zhong M, Finch J, Ritter C, McCracken R, Morrissey J, et al. Rat calcium-sensing receptor is regulated by vitamin D but not by calcium. Am. J. Physiol. 1996 Mar;270(3 Pt 2):F454-460.

32. Arnold A, Brown MF, Ureña P, Gaz RD, Sarfati E, Drüeke TB. Monoclonality of parathyroid tumors in chronic renal failure and in primary parathyroid hyperplasia. J. Clin. Invest. 1995 May;95(5):2047-2053.

33. Gogusev J, Duchambon P, Hory B, Giovannini M, Goureau Y, Sarfati E, et al. Depressed expression of calcium receptor in parathyroid gland tissue of patients with hyperparathyroidism. Kidney Int. 1997 Jan;51(1):328-336.

34. Korkor AB. Reduced binding of [3H]1,25-dihydroxyvitamin D3 in the parathyroid glands of patients with renal failure. N. Engl. J. Med. 1987 Jun 18;316(25):1573-1577.

35. Somerville PJ, Kaye M. Evidence that resistance to the calcemic action of parathyroid hormone in rats with acute uremia is caused by phosphate retention. Kidney Int. 1979 Nov;16(5):552-560.

36. Massry SG, Stein R, Garty J, Arieff AI, Coburn JW, Norman AW, et al. Skeletal resistance to the calcemic action of parathyroid hormone in uremia: role of 1,25 (OH)2 D3. Kidney Int. 1976 Jun;9(6):467-474.

37. Picton ML, Moore PR, Mawer EB, Houghton D, Freemont AJ, Hutchison AJ, et al. Down-regulation of human osteoblast PTH/PTHrP receptor mRNA in end-stage renal failure. Kidney Int. 2000 Oct;58(4):1440-1449.

38. Slatopolsky E, Finch J, Clay P, Martin D, Sicard G, Singer G, et al. A novel mechanism for skeletal resistance in uremia. Kidney Int. 2000 Aug;58(2):753-761.

39. Levin A, Bakris GL, Molitch M, Smulders M, Tian J, Williams LA, et al. Prevalence of abnormal serum vitamin D, PTH, calcium, and phosphorus in patients with chronic kidney disease: results of the study to evaluate early kidney disease. Kidney Int. 2007 Jan;71(1):31-38.

40. Vassalotti JA, Uribarri J, Chen S, Li S, Wang C, Collins AJ, et al. Trends in mineral metabolism: Kidney Early Evaluation Program (KEEP) and the National Health and Nutrition Examination Survey (NHANES) 1999-2004. Am. J. Kidney Dis. 2008 Apr;51(4

Suppl 2):S56-68.

41. Huan J, Olgaard K, Nielsen LB, Lewin E. Parathyroid hormone 7-84 induces hypocalcemia and inhibits the parathyroid hormone 1-84 secretory response to hypocalcemia in rats with intact parathyroid glands. J. Am. Soc. Nephrol. 2006 Jul;17(7):1923-1930.

42. Gao P, D'Amour P. Evolution of the parathyroid hormone (PTH) assay--importance of circulating PTH immunoheterogeneity and of its regulation. Clin. Lab. 2005;51(1-2):21-29.

43. Coen G, Bonucci E, Ballanti P, Balducci A, Calabria S, Nicolai GA, et al. PTH 1-84 and PTH "7-84" in the noninvasive diagnosis of renal bone disease. Am. J. Kidney Dis. 2002 Aug;40(2):348-354.

44. Reichel H, Esser A, Roth H, Schmidt-Gayk H. Influence of PTH assay methodology on differential diagnosis of renal bone disease. Nephrol. Dial. Transplant. 2003 Apr;18(4):759-768.

45. Joly D, Drueke TB, Alberti C, Houillier P, Lawson-Body E, Martin KJ, et al. Variation in serum and plasma PTH levels in second-generation assays in hemodialysis patients: a cross-sectional study. Am. J. Kidney Dis. 2008 Jun;51(6):987-995.

46. Holmes DT, Levin A, Forer B, Rosenberg F. Preanalytical influences on DPC IMMULITE 2000 intact PTH assays of plasma and serum from dialysis patients. Clin. Chem. 2005 May;51(5):915-917.

47. Binkley N, Krueger D, Gemar D, Drezner MK. Correlation among 25-hydroxy-vitamin D assays. J. Clin. Endocrinol. Metab. 2008 May;93(5):1804-1808.

48. Hollis BW. Circulating 25-hydroxyvitamin D levels indicative of vitamin D sufficiency: implications for establishing a new effective dietary intake recommendation for vitamin D. J. Nutr. 2005 Feb;135(2):317-322.

49. Hollis BW. Assessment of vitamin D status and definition of a normal circulating range of 25-hydroxyvitamin D. Curr Opin Endocrinol Diabetes Obes. 2008 Dec;15(6):489-494.

50. Tentori F, Albert JM, Young EW, Blayney MJ, Robinson BM, Pisoni RL, et al. The survival advantage for haemodialysis patients taking vitamin D is questioned: findings from the Dialysis Outcomes and Practice Patterns Study. Nephrol. Dial. Transplant. 2009 Mar;24(3):963-972.

51. Ketteler M, Brandenburg V, Jahnen-Dechent W, Westenfeld R, Floege J. Do not be misguided by guidelines: the calcium x phosphate product can be a Trojan horse. Nephrol. Dial. Transplant. 2005 Apr;20(4):673-677.

52. O'Neill WC. The fallacy of the calcium-phosphorus product. Kidney Int. 2007 Oct;72(7):792-796.

53. Jabbar Z, Aggarwal PK, Chandel N, Kohli HS, Gupta KL, Sakhuja V, et al. High prevalence of vitamin D deficiency in north Indian adults is exacerbated in those with chronic kidney disease. Nephrology (Carlton). 2009 Apr;14(3):345-349.

54. Ritz E, Mehls O, Krempien B. Calcium and phosphorus metabolism in maintenance hemodialysis. Adv. Nephrol. Necker Hosp. 1980;9:71-108.

55. Frick KK, Bushinsky DA. In vitro metabolic and respiratory acidosis selectively inhibit osteoblastic matrix gene expression. Am. J. Physiol. 1999 Nov;277(5 Pt 2):F750-755.

56. Kleeman CR. The role of chronic anion gap and/or nonanion gap acidosis in the osteodystrophy of chronic renal failure in the predialysis era: a minority report. Miner Electrolyte Metab. 1994;20(1-2):81-96.

57. Ferreira A, Ureña P, Ang KS, Simon P, Morieux C, Souberbielle JC, et al. Relationship

between serum beta 2-microglobulin, bone histology, and dialysis membranes in uraemic patients. Nephrol. Dial. Transplant. 1995;10(9):1701-1707.

58. Ghazali A, Fardellone P, Pruna A, Atik A, Achard JM, Oprisiu R, et al. Is low plasma 25-(OH)vitamin D a major risk factor for hyperparathyroidism and Looser's zones independent of calcitriol? Kidney Int. 1999 Jun;55(6):2169-2177.

59. Doumouchtsis KK, Perrea DN, Doumouchtsis SK. The impact of sex hormone changes on bone mineral deficit in chronic renal failure. Endocr. Res. 2009;34(3):90-99.

60. Piraino B, Chen T, Cooperstein L, Segre G, Puschett J. Fractures and vertebral bone mineral density in patients with renal osteodystrophy. Clin. Nephrol. 1988 Aug;30(2):57-62.

61. Gerakis A, Hadjidakis D, Kokkinakis E, Apostolou T, Raptis S, Billis A. Correlation of bone mineral density with the histological findings of renal osteodystrophy in patients on hemodialysis. J. Nephrol. 2000 Dec;13(6):437-443.

62. Araújo SMHA, Ambrosoni P, Lobão RRS, Caorsi H, Moysés RMA, Barreto FC, et al. The renal osteodystrophy pattern in Brazil and Uruguay: an overview. Kidney Int. Suppl. 2003 Jun;(85):S54-56.

63. London GM, Marty C, Marchais SJ, Guerin AP, Metivier F, de Vernejoul M. Arterial calcifications and bone histomorphometry in end-stage renal disease. J. Am. Soc. Nephrol. 2004 Jul;15(7):1943-1951.

64. London GM, Marchais SJ, Guérin AP, Boutouyrie P, Métivier F, de Vernejoul M. Association of bone activity, calcium load, aortic stiffness, and calcifications in ESRD. J. Am. Soc. Nephrol. 2008 Sep;19(9):1827-1835.

65. Barreto DV, Barreto FDC, Carvalho ABD, Cuppari L, Draibe SA, Dalboni MA, et al.

Association of changes in bone remodeling and coronary calcification in hemodialysis patients: a prospective study. Am. J. Kidney Dis. 2008 Dec;52(6):1139-1150.

66. Hutchison AJ, Whitehouse RW, Boulton HF, Adams JE, Mawer EB, Freemont TJ, et al. Correlation of bone histology with parathyroid hormone, vitamin D3, and radiology in end-stage renal disease. Kidney Int. 1993 Nov;44(5):1071-1077.

67. Klawansky S, Komaroff E, Cavanaugh PF, Mitchell DY, Gordon MJ, Connelly JE, et al. Relationship between age, renal function and bone mineral density in the US population. Osteoporos Int. 2003 Jul;14(7):570-576.

68. Rix M, Andreassen H, Eskildsen P, Langdahl B, Olgaard K. Bone mineral density and biochemical markers of bone turnover in patients with predialysis chronic renal failure. Kidney Int. 1999 Sep;56(3):1084-1093.

69. Johnell O, Kanis JA, Oden A, Johansson H, De Laet C, Delmas P, et al. Predictive value of BMD for hip and other fractures. J. Bone Miner. Res. 2005 Jul;20(7):1185-1194.

70. Jamal SA, Hayden JA, Beyene J. Low bone mineral density and fractures in long-term hemodialysis patients: a meta-analysis. Am. J. Kidney Dis. 2007 May;49(5):674-681.

71. Lindergård B, Johnell O, Nilsson BE, Wiklund PE. Studies of bone morphology, bone densitometry and laboratory data in patients on maintenance hemodialysis treatment. Nephron. 1985;39(2):122-129.

72. Hutchison AJ, Whitehouse RW, Boulton HF, Adams JE, Mawer EB, Freemont TJ, et al. Correlation of bone histology with parathyroid hormone, vitamin D3, and radiology in end-stage renal disease. Kidney Int. 1993 Nov;44(5):1071-1077.

73. Lechleitner P, Krimbacher E, Genser N, Fridrich L, zur Nedden D, Helweg G, et al. Bone mineral densitometry in dialyzed patients: quantitative computed tomography versus dual

photon absorptiometry. Bone. 1994 Aug;15(4):387-391.

74. Russo CR, Taccetti G, Caneva P, Mannarino A, Maranghi P, Ricca M. Volumetric bone density and geometry assessed by peripheral quantitative computed tomography in uremic patients on maintenance hemodialysis. Osteoporos Int. 1998;8(5):443-448.

75. Bauer JS, Link TM. Advances in osteoporosis imaging. Eur J Radiol. 2009 Sep;71(3):440-449.

76. Coen G, Ballanti P, Bonucci E, Calabria S, Centorrino M, Fassino V, et al. Bone markers in the diagnosis of low turnover osteodystrophy in haemodialysis patients. Nephrol. Dial. Transplant. 1998 Sep;13(9):2294-2302.

77. Bauer DC, Sklarin PM, Stone KL, Black DM, Nevitt MC, Ensrud KE, et al. Biochemical markers of bone turnover and prediction of hip bone loss in older women: the study of osteoporotic fractures. J. Bone Miner. Res. 1999 Aug;14(8):1404-1410.

78. Ureña P, Bernard-Poenaru O, Ostertag A, Baudoin C, Cohen-Solal M, Cantor T, et al. Bone mineral density, biochemical markers and skeletal fractures in haemodialysis patients. Nephrol. Dial. Transplant. 2003 Nov;18(11):2325-2331.

79. Moe SM, Chen NX. Mechanisms of vascular calcification in chronic kidney disease. J. Am. Soc. Nephrol. 2008 Feb;19(2):213-216.

80. Reynolds JL, Joannides AJ, Skepper JN, McNair R, Schurgers LJ, Proudfoot D, et al. Human vascular smooth muscle cells undergo vesicle-mediated calcification in response to changes in extracellular calcium and phosphate concentrations: a potential mechanism for accelerated vascular calcification in ESRD. J. Am. Soc. Nephrol. 2004 Nov;15(11):2857-2867.

81. Moe SM. Vascular calcification and renal osteodystrophy relationship in chronic kidney

disease. Eur. J. Clin. Invest. 2006 Aug;36 Suppl 2:51-62.

82. Ketteler M. Fetuin-A and extraosseous calcification in uremia. Curr. Opin. Nephrol. Hypertens. 2005 Jul;14(4):337-342.

83. Vliegenthart R, Hollander M, Breteler MMB, van der Kuip DAM, Hofman A, Oudkerk M, et al. Stroke is associated with coronary calcification as detected by electron-beam CT: the Rotterdam Coronary Calcification Study. Stroke. 2002 Feb;33(2):462-465.

84. Ix JH, Shlipak MG, Katz R, Budoff MJ, Shavelle DM, Probstfield JL, et al. Kidney function and aortic valve and mitral annular calcification in the Multi-Ethnic Study of Atherosclerosis (MESA). Am. J. Kidney Dis. 2007 Sep;50(3):412-420.

85. Sharma R, Pellerin D, Gaze DC, Mehta RL, Gregson H, Streather CP, et al. Mitral annular calcification predicts mortality and coronary artery disease in end stage renal disease. Atherosclerosis. 2007 Apr;191(2):348-354.

86. Okuno S, Ishimura E, Kitatani K, Fujino Y, Kohno K, Maeno Y, et al. Presence of abdominal aortic calcification is significantly associated with all-cause and cardiovascular mortality in maintenance hemodialysis patients. Am. J. Kidney Dis. 2007 Mar;49(3):417-425.

87. Kauppila LI, Polak JF, Cupples LA, Hannan MT, Kiel DP, Wilson PW. New indices to classify location, severity and progression of calcific lesions in the abdominal aorta: a 25-year follow-up study. Atherosclerosis. 1997 Jul 25;132(2):245-250.

88. Bellasi A, Ferramosca E, Muntner P, Ratti C, Wildman RP, Block GA, et al. Correlation of simple imaging tests and coronary artery calcium measured by computed tomography in hemodialysis patients. Kidney Int. 2006 Nov;70(9):1623-1628.

89. Block GA, Klassen PS, Lazarus JM, Ofsthun N, Lowrie EG, Chertow GM. Mineral

metabolism, mortality, and morbidity in maintenance hemodialysis. J. Am. Soc. Nephrol. 2004 Aug;15(8):2208-2218.

90. Kestenbaum B, Sampson JN, Rudser KD, Patterson DJ, Seliger SL, Young B, et al. Serum phosphate levels and mortality risk among people with chronic kidney disease. J. Am. Soc. Nephrol. 2005 Feb;16(2):520-528.

91. Ganesh SK, Stack AG, Levin NW, Hulbert-Shearon T, Port FK. Association of elevated serum PO(4), Ca x PO(4) product, and parathyroid hormone with cardiac mortality risk in chronic hemodialysis patients. J. Am. Soc. Nephrol. 2001 Oct;12(10):2131-2138.

92. Naveh-Many T, Rahamimov R, Livni N, Silver J. Parathyroid cell proliferation in normal and chronic renal failure rats. The effects of calcium, phosphate, and vitamin D. J. Clin. Invest. 1995 Oct;96(4):1786-1793.

93. Gal-Moscovici A, Sprague SM. Role of vitamin D deficiency in chronic kidney disease. J. Bone Miner. Res. 2007 Dec;22 Suppl 2:V91-94.

94. Giachelli CM. The emerging role of phosphate in vascular calcification. Kidney Int. 2009 May;75(9):890-897.

95. K/DOQI clinical practice guidelines for bone metabolism and disease in chronic kidney disease. Am. J. Kidney Dis. 2003 Oct;42(4 Suppl 3):S1-201.

96. Chertow GM, Raggi P, McCarthy JT, Schulman G, Silberzweig J, Kuhlik A, et al. The effects of sevelamer and calcium acetate on proxies of atherosclerotic and arteriosclerotic vascular disease in hemodialysis patients. Am. J. Nephrol. 2003 Oct;23(5):307-314.

97. Russo D, Miranda I, Ruocco C, Battaglia Y, Buonanno E, Manzi S, et al. The progression of coronary artery calcification in predialysis patients on calcium carbonate or sevelamer. Kidney Int. 2007 Nov;72(10):1255-1261.

98. Spasovski GB, Sikole A, Gelev S, Masin-Spasovska J, Freemont T, Webster I, et al. Evolution of bone and plasma concentration of lanthanum in dialysis patients before, during 1 year of treatment with lanthanum carbonate and after 2 years of follow-up. Nephrol. Dial. Transplant. 2006 Aug;21(8):2217-2224.

99. Culleton BF, Walsh M, Klarenbach SW, Mortis G, Scott-Douglas N, Quinn RR, et al. Effect of frequent nocturnal hemodialysis vs conventional hemodialysis on left ventricular mass and quality of life: a randomized controlled trial. JAMA. 2007 Sep 19;298(11):1291-1299.

100. Young EW, Albert JM, Satayathum S, Goodkin DA, Pisoni RL, Akiba T, et al. Predictors and consequences of altered mineral metabolism: the Dialysis Outcomes and Practice Patterns Study. Kidney Int. 2005 Mar;67(3):1179-1187.

101. Tentori F, Blayney MJ, Albert JM, Gillespie BW, Kerr PG, Bommer J, et al. Mortality risk for dialysis patients with different levels of serum calcium, phosphorus, and PTH: the Dialysis Outcomes and Practice Patterns Study (DOPPS). Am. J. Kidney Dis. 2008 Sep;52(3):519-530.

102. Hou SH, Zhao J, Ellman CF, Hu J, Griffin Z, Spiegel DM, et al. Calcium and phosphorus fluxes during hemodialysis with low calcium dialysate. Am. J. Kidney Dis. 1991 Aug;18(2):217-224.

103. McIntyre CW. Calcium balance during hemodialysis. Semin Dial. 2008 Feb;21(1):38-42.

104. Maynard JC, Cruz C, Kleerekoper M, Levin NW. Blood pressure response to changes in serum ionized calcium during hemodialysis. Ann. Intern. Med. 1986 Mar;104(3):358-361.

105. Kalantar-Zadeh K, Kuwae N, Regidor DL, Kovesdy CP, Kilpatrick RD, Shinaberger CS, et al. Survival predictability of time-varying indicators of bone disease in maintenance

hemodialysis patients. Kidney Int. 2006 Aug;70(4):771-780.

106. Barreto FC, Barreto DV, Moysés RMA, Neves KR, Canziani MEF, Draibe SA, et al. K/DOQI-recommended intact PTH levels do not prevent low-turnover bone disease in hemodialysis patients. Kidney Int. 2008 Mar;73(6):771-777.

107. Baker LR, Muir JW, Sharman VL, Abrams SM, Greenwood RN, Cattell WR, et al. Controlled trial of calcitriol in hemodialysis patients. Clin. Nephrol. 1986 Oct;26(4):185-191.

108. Nordal KP, Dahl E. Low dose calcitriol versus placebo in patients with predialysis chronic renal failure. J. Clin. Endocrinol. Metab. 1988 Nov;67(5):929-936.

109. Block GA, Martin KJ, de Francisco ALM, Turner SA, Avram MM, Suranyi MG, et al. Cinacalcet for secondary hyperparathyroidism in patients receiving hemodialysis. N. Engl. J. Med. 2004 Apr 8;350(15):1516-1525.

110. Lindberg JS, Culleton B, Wong G, Borah MF, Clark RV, Shapiro WB, et al. Cinacalcet HCl, an oral calcimimetic agent for the treatment of secondary hyperparathyroidism in hemodialysis and peritoneal dialysis: a randomized, double-blind, multicenter study. J. Am. Soc. Nephrol. 2005 Mar;16(3):800-807.

111. Neonakis E, Wheeler MH, Krishnan H, Coles GA, Davies F, Woodhead JS. Results of surgical treatment of renal hyperparathyroidism. Arch Surg. 1995 Jun;130(6):643-648.

112. Gasparri G, Camandona M, Abbona GC, Papotti M, Jeantet A, Radice E, et al. Secondary and tertiary hyperparathyroidism: causes of recurrent disease after 446 parathyroidectomies. Ann. Surg. 2001 Jan;233(1):65-69.

113. Chertow GM, Burke SK, Raggi P. Sevelamer attenuates the progression of coronary and aortic calcification in hemodialysis patients. Kidney Int. 2002 Jul;62(1):245-252.

114. Suki WN, Zabaneh R, Cangiano JL, Reed J, Fischer D, Garrett L, et al. Effects of sevelamer and calcium-based phosphate binders on mortality in hemodialysis patients. Kidney Int. 2007 Nov;72(9):1130-1137.

115. Block GA, Raggi P, Bellasi A, Kooienga L, Spiegel DM. Mortality effect of coronary calcification and phosphate binder choice in incident hemodialysis patients. Kidney Int. 2007 Mar;71(5):438-441.

116. Lopez I, Mendoza FJ, Aguilera-Tejero E, Perez J, Guerrero F, Martin D, et al. The effect of calcitriol, paricalcitol, and a calcimimetic on extraosseous calcifications in uremic rats. Kidney Int. 2008 Feb;73(3):300-307.

117. Fellström BC, Jardine AG, Schmieder RE, Holdaas H, Bannister K, Beutler J, et al. Rosuvastatin and cardiovascular events in patients undergoing hemodialysis. N. Engl. J. Med. 2009 Apr 2;360(14):1395-1407.

118. Baigent C, Landry M. Study of Heart and Renal Protection (SHARP). Kidney Int. Suppl. 2003 May;(84):S207-210.

119. Pressman GS, Crudu V, Parameswaran-Chandrika A, Romero-Corral A, Purushottam B, Figueredo VM. Can total cardiac calcium predict the coronary calcium score? Int. J. Cardiol [Internet]. 2009 Jul 15 [cited 2011 Jan 9];Available from: http://www.ncbi.nlm.nih.gov/pubmed/19615766

120. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004 Jan 10;363(9403):157-163.

121. I. CKD Registry of India: 3rd Annual Report, 2008, available at http://www.ckdri.org/CKD%20NEWSLETTER%203rd%20Annual%20Report.pdf.

122. Harinarayan CV, Ramalakshmi T, Venkataprasad U. High prevalence of low dietary calcium and low vitamin D status in healthy south Indians. Asia Pac J Clin Nutr. 2004;13(4):359-364.

123. Arya V, Bhambri R, Godbole MM, Mithal A. Vitamin D status and its relationship with bone mineral density in healthy Asian Indians. Osteoporos Int. 2004 Jan;15(1):56-61.

124. Pittas AG, Lau J, Hu FB, Dawson-Hughes B. The role of vitamin D and calcium in type 2 diabetes. A systematic review and meta-analysis. J. Clin. Endocrinol. Metab. 2007 Jun;92(6):2017-2029.

125. Pittas AG, Harris SS, Stark PC, Dawson-Hughes B. The effects of calcium and vitamin D supplementation on blood glucose and markers of inflammation in nondiabetic adults. Diabetes Care. 2007 Apr;30(4):980-986.

126. Lo CW, Paris PW, Holick MF. Indian and Pakistani immigrants have the same capacity as Caucasians to produce vitamin D in response to ultraviolet irradiation. Am. J. Clin. Nutr. 1986 Nov;44(5):683-685.

127. Awumey EM, Mitra DA, Hollis BW, Kumar R, Bell NH. Vitamin D metabolism is altered in Asian Indians in the southern United States: a clinical research center study. J. Clin. Endocrinol. Metab. 1998 Jan;83(1):169-173.

128. Wortsman J, Matsuoka LY, Chen TC, Lu Z, Holick MF. Decreased bioavailability of vitamin D in obesity. The American Journal of Clinical Nutrition. 2000;72(3):690 -693.

129. Karhapää P, Pihlajamäki J, Pörsti I, Kastarinen M, Mustonen J, Niemelä O, et al. Diverse associations of 25-hydroxyvitamin D and 1,25-dihydroxy-vitamin D with dyslipidaemias. J. Intern. Med. 2010 Dec;268(6):604-610.

130. Martins D, Wolf M, Pan D, Zadshir A, Tareen N, Thadhani R, et al. Prevalence of

Cardiovascular Risk Factors and the Serum Levels of 25-Hydroxyvitamin D in the United States: Data From the Third National Health and Nutrition Examination Survey. Arch Intern Med. 2007 Jun 11;167(11):1159-1165.

131. Luquet S, Gaudel C, Holst D, Lopez-Soriano J, Jehl-Pietri C, Fredenrich A, et al. Roles of PPAR delta in lipid absorption and metabolism: a new target for the treatment of type 2 diabetes. Biochim. Biophys. Acta. 2005 May 30;1740(2):313-317.

132. Yonemura K, Sugiura T, Yamashita F, Matsushima H, Hishida A. Supplementation with Alfacalcidol increases protein intake and serum albumin concentration in patients undergoing hemodialysis with hpoalbumineamia. Blood Purif. 2004;22(2):210-215.

133. Yamamoto T, Ozono K, Miyauchi A, Kasayama S, Kojima Y, Shima M, et al. Role of advanced glycation end products in adynamic bone disease in patients with diabetic nephropathy. Am. J. Kidney Dis. 2001 Oct;38(4 Suppl 1):S161-164.

134. Vincenti F, Arnaud SB, Recker R, Genant H, Amend WJ, Feduska NJ, et al. Parathyroid and bone response of the diabetic patient to uremia. Kidney Int. 1984 Apr;25(4):677-682.

135. Haden ST, Brown EM, Hurwitz S, Scott J, El-Hajj Fuleihan G. The effects of age and gender on parathyroid hormone dynamics. Clin. Endocrinol. (Oxf). 2000 Mar;52(3):329-338.

136. Avram MM, Mittman N, Myint MM, Fein P. Importance of low serum intact parathyroid hormone as a predictor of mortality in hemodialysis and peritoneal dialysis patients: 14 years of prospective observation. Am. J. Kidney Dis. 2001 Dec;38(6):1351-1357.

137. Prince RL. Counterpoint: estrogen effects on calcitropic hormones and calcium homeostasis. Endocr. Rev. 1994 Jun;15(3):301-309.

138. Carrillo-López N, Román-García P, Rodríguez-Rebollar A, Fernández-Martín JL, Naves-

Díaz M, Cannata-Andía JB. Indirect regulation of PTH by estrogens may require FGF23. J. Am. Soc. Nephrol. 2009 Sep;20(9):2009-2017.

139. Zingraff J, Jungers P, Pélissier C, Nahoul K, Feinstein MC, Scholler R. Pituitary and ovarian dysfunctions in women on haemodialysis. Nephron. 1982;30(2):149-153.

140. Ix JH, Shlipak MG, Katz R, Budoff MJ, Shavelle DM, Probstfield JL, et al. Kidney function and aortic valve and mitral annular calcification in the Multi-Ethnic Study of Atherosclerosis (MESA). Am. J. Kidney Dis. 2007 Sep;50(3):412-420.

141. Adeney KL, Siscovick DS, Ix JH, Seliger SL, Shlipak MG, Jenny NS, et al. Association of serum phosphate with vascular and valvular calcification in moderate CKD. J. Am. Soc. Nephrol. 2009 Feb;20(2):381-387.

142. Bellasi A, Ferramosca E, Muntner P, Ratti C, Wildman RP, Block GA, et al. Correlation of simple imaging tests and coronary artery calcium measured by computed tomography in hemodialysis patients. Kidney Int. 2006 Nov;70(9):1623-1628.

143. Russo D, Corrao S, Miranda I, Ruocco C, Manzi S, Elefante R, et al. Progression of coronary artery calcification in predialysis patients. Am. J. Nephrol. 2007;27(2):152-158.

144. Ribeiro S, Ramos A, Brandão A, Rebelo JR, Guerra A, Resina C, et al. Cardiac valve calcification in haemodialysis patients: role of calcium-phosphate metabolism. Nephrol. Dial. Transplant. 1998 Aug;13(8):2037-2040.

145. Rostand SG, Sanders C, Kirk KA, Rutsky EA, Fraser RG. Myocardial calcification and cardiac dysfunction in chronic renal failure. Am. J. Med. 1988 Nov;85(5):651-657.

146. Wang AY, Wang M, Woo J, Lam CW, Li PK, Lui S, et al. Cardiac valve calcification as an important predictor for all-cause mortality and cardiovascular mortality in long-term peritoneal dialysis patients: a prospective study. J. Am. Soc. Nephrol. 2003 Jan;14(1):159-

168.

147. Toussaint ND, Lau KK, Strauss BJ, Polkinghorne KR, Kerr PG. Associations between vascular calcification, arterial stiffness and bone mineral density in chronic kidney disease. Nephrol. Dial. Transplant. 2008 Feb;23(2):586-593.

148. Kramer H, Toto R, Peshock R, Cooper R, Victor R. Association between chronic kidney disease and coronary artery calcification: the Dallas Heart Study. J. Am. Soc. Nephrol. 2005 Feb;16(2):507-513.

149. Garland JS, Holden RM, Groome PA, Lam M, Nolan RL, Morton AR, et al. Prevalence and associations of coronary artery calcification in patients with stages 3 to 5 CKD without cardiovascular disease. Am. J. Kidney Dis. 2008 Nov;52(5):849-858.

150. Sigrist MK, Taal MW, Bungay P, McIntyre CW. Progressive vascular calcification over 2 years is associated with arterial stiffening and increased mortality in patients with stages 4 and 5 chronic kidney disease. Clin J Am Soc Nephrol. 2007 Nov;2(6):1241-1248.

151. Rodríguez-García M, Gómez-Alonso C, Naves-Díaz M, Diaz-Lopez JB, Diaz-Corte C, Cannata-Andía JB. Vascular calcifications, vertebral fractures and mortality in haemodialysis patients. Nephrol. Dial. Transplant. 2009 Jan;24(1):239-246.

152. Gerakis A, Hadjidakis D, Kokkinakis E, Apostolou T, Raptis S, Billis A. Correlation of bone mineral density with the histological findings of renal osteodystrophy in patients on hemodialysis. J. Nephrol. 2000 Dec;13(6):437-443.

153. Lobão R, Carvalho AB, Cuppari L, Ventura R, Lazaretti-Castro M, Jorgetti V, et al. High prevalence of low bone mineral density in pre-dialysis chronic kidney disease patients: bone histomorphometric analysis. Clin. Nephrol. 2004 Dec;62(6):432-439.

154. Sumino H, Ichikawa S, Kasama S, Takahashi T, Kumakura H, Takayama Y, et al. Elevated

arterial stiffness in postmenopausal women with osteoporosis. Maturitas. 2006 Oct 20;55(3):212-218.

155. Seo SK, Cho S, Kim HY, Choi YS, Park KH, Cho DJ, et al. Bone mineral density, arterial stiffness, and coronary atherosclerosis in healthy postmenopausal women. Menopause. 2009 Oct;16(5):937-943.

156. Wilson PW, Kauppila LI, O'Donnell CJ, Kiel DP, Hannan M, Polak JM, et al. Abdominal aortic calcific deposits are an important predictor of vascular morbidity and mortality. Circulation. 2001 Mar 20;103(11):1529-1534.

157. Jamal SA, Swan VJD, Brown JP, Hanley DA, Prior JC, Papaioannou A, et al. Kidney function and rate of bone loss at the hip and spine: the Canadian Multicentre Osteoporosis Study. Am. J. Kidney Dis. 2010 Feb;55(2):291-299.

158. Hsu C, Cummings SR, McCulloch CE, Chertow GM. Bone mineral density is not diminished by mild to moderate chronic renal insufficiency. Kidney Int. 2002 May;61(5):1814-1820.

PROFORMA

Patient ID:

DEMOGRAPHIC CHARACTERISTICS	
NAME	
AGE/SEX	
H. Number.	
ADDRESS and contact number	
Socioeconomic data • Number of family members • Earning members • Monthly family income • Occupation of patient • Educational qualifications	

HISTORY	
Symptomatology with duration	
Duration of uraemic symptoms (in months)	
Histological diagnosis (if available) or NKD (if known)	
Date of initiation of dialysis and frequency	
Modality of dialysis (HD/PD)	
Residual kidney function (urine output)	
GFR/1.73 m^2 (aMDRD)	
History of bone pains	
Pathological fractures	
Joint effusions	
Red eyes	
Pruritus	
Proximal muscle weakness	
Past history	
HT	
DM	
H/o exposure to aluminium	
Personal history	
Smoking (if yes, quantity and duration)	
Alcohol (if yes, quantity and duration)	
Sun exposure (hours per day)	
Menstrual history (in females) Obstetric history (in females)	
Milk consumption (ml/day)	

Diet (vegetarian, non vegetarian)	
DRUG HISTORY	
Whether on calcitriol, if so for how long	
Route of administration and dose	
Whether on Phosphate binders, if so for how long	
Name and dose	
Calcium supplements (dose, duration)	
Elemental calcium intake per day	

PHYSICAL EXAMINATION

Height	
Weight	
BMI	

INVESTIGATIONS

AC/PC	
Lipid profile	
Hb	
B. urea/S. creatinine	
Ca/P	
S. Bicarbonate	
PTH (iced sample)	
ALP	
25 hydroxy vitamin D	
S. Albumin	
DEXA scan femoral neck • BMD • T score	
X ray abdomen lateral view Calcification present? If yes, grade L1 (Ant/post) L2 (Ant/post) L3 (Ant/post) L4 (Ant/post) Affected segment score Anteroposterior affected score Anteroposterior severity score	yes/no
Echocardiography **Simplified Echocardiographic score** Aortic valve calcification (0 = absent, 1 = present) Mitral valve or annular calcification (0 = absent, 1 = present) Subvalvular apparatus calcification (0 = absent, 1 = present)	

Restriction of either valve (0 = absent, 1 = present) **Total score** **<u>Main Echocardiographic score</u>** Posterior annulus, by thirds (0-3) PML restriction (0 = absent, 1 = present) Anterior annulus calcification (0 = absent, 1= present) AML restriction (0 = absent, 1= present) MV calcification (0 = absent, 1 = mild, 2 = > mild) Subvalvular apparatus calcification (0 = absent,1 = present) AV calcification (0 = absent, 1 = nodule in < 3 leaflets, 2 = nodules in 3 leaflets, non restrictive; 3 = restrictive) Aortic root calcification (0 = absent,1 = present) **Total score**	

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
1	571414d	38	2	2	6	1	7	3	3	30	0	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
2	571791d	60	5	1	2	6	1	2	3	15	1	0	0	0	0	0	0	0.5	.	0	1	0.5	3.25	2	0.5
3	573048d	40	3	2	3	1	18	2	3	15	1	0	1	0	0	0	0	0.5	12	100	2	0	0	4	0
4	575232d	21	3	2	4	1	1	4	1	4	1	0	0	1	0	0	0	0.5	0	100	2	0	0	4	0
5	573831d	34	2	2	2	1	2	3	3	14	1	0	0	1	0	0	0	0.5	0	0	1	0.5	3.25	1	0.5
6	573889d	52	3	1	3	4	1	3	3	6	0	0	0	0	0	0	0	1.5	.	500	2	0.5	3.25	1	0.5
7	574479d	56	2	2	1	1	1	2	3	13	0	0	0	0	0	0	0	1	0	500	1	0.3	2.5	4	0
8	573845d	55	2	1	5	4	3	2	3	29	0	0	0	0	0	0	0	6	.	0	2	0	0	4	0
9	576256d	42	2	1	5	7	3	1	3	5	0	0	1	0	0	1	0	2	.	0	2	0.3	2.5	4	0
10	567480d	61	1	1	2	1	24	2	3	18	0	0	0	0	0	1	0	0.5	.	500	1	0	0	4	0
11	574085d	45	2	1	2	2	2	1	3	3	0	0	0	0	0	0	0	3	.	0	2	0	0	4	0
12	569111d	48	2	2	3	1	3	3	3	15	1	0	0	1	0	0	0	0.5	8	250	1	0	0	4	0
13	574003d	62	2	2	2	1	3	4	3	7	1	0	1	1	0	0	0	0.5	60	0	1	1	7.5	4	0
14	576925d	72	3	1	5	1	1	3	3	13	0	0	0	0	0	0	0	3	.	250	2	0	0	4	0
15	573914d	25	6	1	2	7	3	1	1	6	0	0	1	0	0	0	0	0.5	.	0	1	2.5	18.7	4	0
16	573847d	60	7	1	6	4	24	2	3	15	0	0	0	0	0	0	0	0.5	.	200	2	2	15	4	0
17	576300d	56	2	2	5	1	4	1	3	7	1	0	0	1	1	0	0	0.5	60	0	2	0	0	4	0
18	576209d	53	3	1	6	4	0	2	3	11	0	0	0	0	0	0	0	6	.	250	2	0	0	4	0
19	936663c	61	1	1	5	1	1	2	3	7	0	0	0	0	0	0	0	0	.	100	2	0	0	4	0
20	579790d	35	3	1	6	5	6	1	3	5	0	0	0	0	0	0	0	5	.	0	2	0.3	2.5	3	0.3
21	579724d	33	2	2	2	1	12	2	3	13	1	0	0	1	1	0	0	0.5	0	250	2	0	0	4	0
22	576217d	21	4	2	3	1	3	5	3	13	1	0	0	0	0	0	0	0.5	0	0	2	2	15	4	0
23	579878d	50	2	1	3	7	9	2	3	11	0	0	1	1	1	0	0	0	.	0	2	1.5	22.5	4	0
24	507233d	52	9	1	4	4	0	3	3	28	1	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
25	576687d	65	3	1	4	1	0	3	3	18	0	0	0	0	0	0	0	0.5	.	200	1	0	0	1	0.5
26	576862d	62	2	1	4	6	1	2	3	10	0	0	0	0	0	1	0	4	.	100	2	0	0	4	0
27	580058d	44	10	1	4	4	4	4	1	10	0	0	0	0	0	0	0	1.5	.	0	2	0.5	7.5	4	0
28	579828d	48	10	2	3	1	0	1	3	23	1	0	0	1	1	0	0	0.5	0	0	1	1	7.5	4	0
29	574010d	33	5	1	2	2	6	1	3	14	0	0	0	0	0	1	0	6	.	200	1	0	0	4	0
30	573748d	60	5	1	3	1	6	3	3	30	1	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
31	580342d	55	2	1	5	4	3	6	3	22	1	0	0	0	0	0	0	3	.	250	2	0	0	4	0
32	583207d	64	3	1	3	1	3	2	1	7	0	0	1	1	0	0	0	0.5	.	100	2	0	0	4	0
33	578484d	53	12	1	5	1	24	2	3	18	1	0	1	0	0	1	0	2	.	0	1	2.5	18.7	4	0
34	578920d	45	3	1	3	6	2	2	3	10	1	0	1	1	0	1	1	2.5	.	0	2	0	0	1	1
35	580745d	50	6	1	3	4	1	1	3	12	1	0	1	0	1	0	0	6	.	0	1	0.66	5	1	0.5
36	581281d	43	2	1	3	6	3	4	3	4	0	0	0	0	0	0	0	2	.	0	2	0	0	4	0
37	580677d	60	2	1	5	4	6	2	3	11	0	0	0	0	0	0	0	0.5	.	100	2	0.1	3.5	4	0
38	581120d	45	9	1	5	4	3	1	3	10	0	0	0	0	0	1	0	0.5	.	0	1	2.5	12.5	4	0
39	576413d	20	8	1	5	1	3	5	3	9	1	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
40	583649d	49	2	1	2	2	3	1	3	6	1	0	0	1	0	0	0	3	.	0	1	0	0	4	0
41	583673d	35	2	1	5	4	5	4	3	15	1	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
42	579791d	25	2	1	5	1	6	1	1	5	0	0	0	0	0	0	0	4	.	0	2	0	0	4	0
43	583766d	42	13	1	3	4	2	4	3	22	0	0	0	1	0	0	0	6	.	200	2	0	0	4	0
44	206733d	38	1	2	3	1	0	4	3	27	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
45	565799d	55	2	1	5	4	3	2	3	12	0	0	0	0	0	0	0	2.5	.	100	2	0	0	4	0
46	577155d	50	1	1	3	2	0	2	3	29	0	0	0	0	0	0	0	1	.	200	2	0	0	4	0
47	584881d	50	1	2	1	1	6	2	3	18	0	0	0	0	0	0	0	0.5	36	0	1	0	0	4	0
48	584613d	43	8	1	5		3	1	3	25	0	0	0	0	0	0	0	0.5	.	.	2	0	0	4	0
49	583477d	34	2	2	2	1	12	1	3	5	1	0	0	0	0	0	0	0.5	.	0	2	1	7.5	4	0
50	584734d	52	2	2	6	1	24	2	3	17	1	0	1	1	0	0	0	0.5	240	0	2	0	0	4	0
51	392244c	53	2	1	5	4	3	1	3	8	1	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
52	584344d	39	2	1	2	2	1	1	3	4	0	0	0	0	0	1	0	7	.	0	2	0.6	7.5	4	0
53	581099d	55	2	1	3	1	0	1	3	25	1	0	0	0	0	1	1	0.5	.	0	2	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
1	0	0	0	0	29	9	2	157	201	31	75	8	4	18	1141	122	19	5	0.646	-1.8	.	.	0	.	.	.
2	0	0	1	10	22	8	4	163	83	44	83	8	5	22	214	123	23	4	0.673	-1.8	.	.	1	1	2	3
3	0	0	1	6	19	6	4	149	96	46	81	9	5	12	622	106	24	3	0.518	-3	.	.	0	.	.	.
4	0	0	0	0	22	9	14	172	131	62	68	7	9	13	744	87	13	3	0.72	-1.2	.	.	0	.	.	.
5	0	0	2	0	26	8	4	104	109	32	43	7	4	16	2500	950	19	4	0.816	-0.3	.	.	0	.	.	.
6	0	0	5	0	23	7	10	109	130	30	45	7	7	11	859	88	31	5	0.651	-2.1	.	.	0	.	.	.
7	0	0	0	0	23	9	4	193	200	24	110	9	5	23	103	168	31	4	0.892	0.4	.	.	0	.	.	.
8	0	0	2	10	24	11	3	171	106	47	93	9	5	21	185	89	17	4	0.729	-1.5	.	.	1	2	3	7
9	500	0.3	8	0	24	8	13	158	202	47	63	7	8	13	938	93	22	4	0.85	-0.6	.	.	0	.	.	.
10	0	0	2	20	24	8	4	297	157	34	193	8	4	21	535	133	13	3	0.657	-2	.	.	0	.	.	.
11	0	0	1	0	24	8	17	135	89	45	61	9	8	14	205	78	23	3	0.589	-2.5	.	.	0	.	.	.
12	0	0	0	0	21	8	4	144	107	35	77	6	6	15	2042	361	24	4	0.488	-3.3	.	.	0	.	.	.
13	500	1	0	0	22	8	7	152	107	42	73	9	6	19	107	132	14	3	0.534	-2.8	.	.	0	.	.	.
14	0	0	0	15	29	11	5	119	141	29	157	9	4	16	176	83	18	3	0.822	-0.8	.	.	0	.	.	.
15	1000	2.5	0	0	17	7	11	102	64	37	37	8	3	15	87	102	41	4	0.545	-2.8	.	.	0	.	.	.
16	500	2	20	2	18	8	4	176	53	35	114	8	4	22	90	42	29	3	0.669	-1.9	.	.	0	.	.	.
17	0	0	5	0	26	7	6	108	95	27	55	6	7	14	722	100	24	4	0.651	-1.8	.	.	0	.	.	.
18	0	0	10	15	26	9	6	102	111	36	37	8	3	19	873	97	17	4	1.06	0.9	.	.	0	.	.	.
19	1000	1	1	5	25	7	8	105	49	34	62	8	4	24	324	69	31	4	0.605	-2.4	.	.	0	.	.	.
20	1000	0.3	1	0	25	7	13	56	39	27	16	8	6	16	0.9	82	29	4	0.714	-1.6	0	0	0	.	.	.
21	0	0	4	0	22	7	4	156	148	30	87	8	6	16	0.9	56	24	4	0.601	-2.2	0	0	0	.	.	.
22	0	0	0	0	24	10	4	166	55	45	95	8	5	16	0.9	86	15	4	0.695	-1.4	.	.	0	.	.	.
23	1000	1	5	17	.	5	6	108	44	46	39	9	5	15	0.9	120	27	3	0.571	-2.6	1	1	1	3	5	8
24	0	0	1	0	28	14	3	137	94	38	76	9	4	22	79	73	23	4	0.854	-0.6	1	0	0	.	.	.
25	0	0	5	0	24	11	4	82	75	32	30	8	4	23	152	72	28	4	.	.	1	0	0	.	.	.
26	0	0	0	10	27	9	6	133	76	35	74	8	4	22	902	56	22	4	0.709	-1.6	1	1	0	.	.	.
27	1000	0.5	0	0	22	7	6	125	56	36	69	9	3	21	342	31	23	3	0.711	-1.6	5	3	0	.	.	.
28	500	1	4	0	22	10	2	142	72	47	73	8	4	20	542	.	18	4	0.626	-2	.	.	0	.	.	.
29	0	0	6	0	22	13	5	188	224	29	104	8	3	28	287	118	34	4	0.719	-1.6	.	.	0	.	.	.
30	0	0	3	0	20	13	2	154	102	31	91	9	4	18	145	96	24	4	0.614	-2.3	.	.	0	.	.	.
31	0	0	30	0	25	12	3	94	81	29	46	8	4	24	533	98	30	4	0.706	-1.6	1	0	0	.	.	.
32	0	0	2	2	22	11	8	183	73	57	93	8	6	21	255	92	45	2	0.588	-2.5	1	0	0	.	.	.
33	1500	2.5	10	2	22	11	4	98	79	20	65	8	3	19	527	137	48	4	0.7	-1.7	1	0	0	.	.	.
34	1500	1	0	10	18	8	7	202	40	68	101	8	6	16	566	140	21	3	0.523	-3	4	1	0	.	.	.
35	1000	0.5	0	0	20	9	5	94	71	29	50	8	5	15	125	63	26	4	0.769	-1.2	3	1	0	.	.	.
36	0	0	1	0	27	8	14	104	157	33	36	7	9	15	502	61	21	4	0.679	-1.8	3	1	0	.	.	.
37	1000	0.1	25	20	21	8	6	210	255	26	118	9	4	20	357	67	19	4	0.606	-2.4	6	3	0	.	.	.
38	1000	2.5	7	0	24	7	7	348	241	47	221	10	7	21	59	88	20	2	0.756	-1.3	8	4	0	.	.	.
39	0	0	0	0	20	10	8	.	.	49	35	8	5	18	358	122	18	4	0.961	0.2	0	0	0	.	.	.
40	0	0	5	0	25	6	10	.	.	.	.	4	8	14	644	543	21	4	0.575	-2.6	.	.	0	.	.	.
41	0	0	1	0	18	10	5	147	51	54	67	9	6	26	168	66	36	4	0.879	-0.4	1	0	0	.	.	.
42	0	0	1	0	17	8	13	159	108	43	83	6	10	19	781	102	20	4	0.754	-1.3	0	0	0	.	.	.
43	0	0	0	0	25	11	3	399	220	56	257	8	6	32	285	136	18	3	0.748	-1.3	4	2	0	.	.	.
44	0	0	1	0	30	13	2	206	174	31	128	9	4	21	147	72	28	4	1.72	-1.2	1	0	0	.	.	.
45	0	0	8	8	20	8	5	106	59	55	28	8	5	27	382	63	22	4	0.643	-2.1	1	0	0	.	.	.
46	0	0	10	5	26	14	3	187	177	30	121	9	4	24	138	67	26	5	0.684	-1.8	0	0	0	.	.	.
47	0	0	1	10	29	10	3	258	200	38	168	8	4	21	103	89	29	3	0.781	-0.6	3	2	0	.	.	.
48	0	0	0	0	16	13	3	139	56	52	66	9	4	25	238	130	.	5	.	.	4	3	0	.	.	.
49	0	0	0	0	21	8	9	188	68	60	98	6	6	21	1042	176	.	4	.	.	3	2	0	.	.	.
50	0	0	10	10	27	11	4	149	113	46	76	8	5	16	434	137	17	4	0.443	-3.7	1	0	0	.	.	.
51	0	0	1	0	.	7	8	140	57	58	72	9	6	16	770	105	16	4	.	.	3	2	1	2	3	3
52	0	0	2	0	18	7	14	77	78	20	36	6	9	10	856	79	45	4	0.709	-1.6	0	0	0	.	.	.
53	0	0	0	0	21	10	3	190	163	27	128	9	3	26	251	139	35	4	0.655	-2	4	2	2	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
54	584725d	24	3	1	3	1	4	4	3	19	1	0	1	1	0	0	0	0.5	.	0	2	0	0	4	0
55	585038d	32	2	1	5	4	2	1	3	11	0	0	0	0	0	0	0	1.5	.	0	2	0.3	2.5	1	0.6
56	584778d	60	3	1	1	6	1	2	3	5	1	0	0	0	0	0	1	1	.	0	2	0.5	3.25	1	0.5
57	589184d	37	3	1	5	4	3	6	3	15	0	0	0	0	0	0	0	1.5	.	100	1	0	0	4	0
58	589166d	27	2	2	5	1	6	1	3	17	0	0	1	0	0	0	0	0.5	0	0	2	0	0	4	0
59	539456d	65	11	1	3	1	1	2	3	19	0	0	0	0	0	1	1	1	.	200	2	0	0	4	0
60	589381d	65	8	1	1	1	2	2	3	11	1	0	0	0	0	1	0	0.5	.	0	2	2	15	4	0
61	593715d	56	2	1	4	4	3	2	3	28	1	0	1	1	0	0	0	1	.	0	1	0	0	4	0
62	593287d	30	2	1	3	6	3	1	3	10	1	0	1	0	0	1	0	3	.	100	2	0	0	4	0
63	594468d	40	3	1	2	2	2	1	3	18	0	0	0	0	0	0	0	2.5	.	200	2	0.1	0.5	1	0.6
64	593502d	58	1	2	1	1	1	1	3	18	0	0	0	0	0	0	0	0.5	240	300	2	0	0	4	0
65	590197d	60	2	2	3	1	6	4	3	4	0	0	1	0	0	0	0	0.5	120	0	2	0.1	2.5	4	0
66	579324d	56	3	1	3	4	0	2	3	17	1	0	0	0	0	1	0	1.5	.	200	2	0	0	4	0
67	594432d	45	3	2	6	4	2	1	3	3	0	0	0	0	0	0	0	1.5	0	200	1	0.5	7.5	1	0.5
68	592636d	46	1	1	2	2	6	2	3	7	0	0	1	0	0	1	1	1	.	200	1	0	0	4	0
69	589421d	44	2	1	3	7	2	2	3	20	0	0	1	1	0	1	0	2.5	.	100	2	0	0	4	0
70	587248d	49	6	2	3	1	2	2	3	11	0	0	0	1	0	0	0	1.5	0	500	1	1	7.5	1	0.5
71	585175d	22	3	1	5	1	1	1	3	19	0	0	0	0	0	0	0	3	.	200	2	0	0	3	0.5
72	588092d	55	1	1	3	1	1	2	3	15	0	0	0	0	0	1	0	0.5	.	200	2	0	0	4	0
73	589225d	24	3	1	3	2	1	4	3	5	0	0	0	0	0	0	0	2	.	200	2	0	0	1	1
74	593880d	29	3	1	2	2	1	4	1	4	1	0	0	0	0	1	0	1.5	.	150	2	0	0	1	0.5
75	592685d	40	7	2	1	1	1	1	3	15	0	0	0	0	0	0	0	1.5	0	0	1	0.5	0	4	0
76	593887d	52	3	1	5	4	1	2	3	6	0	0	0	0	0	0	0	5	.	500	1	0	0	4	0
77	593896d	25	2	1	2	2	1	2	3	8	0	0	0	0	0	0	0	3	.	200	2	0	0	4	0
78	593353d	27	14	2	5	1	1	1	3	5	0	0	0	0	0	0	0	0.5	0	100	2	0	0	1	0.5
79	587299d	55	3	1	5	4	1	6	3	16	0	0	0	0	0	0	0	0.5	.	0	2	1	22.5	4	0
80	593107d	65	1	2	1	1	0	1	3	17	0	0	0	0	0	0	0	0.5	120	0	1	0	0	4	0
81	589255d	35	6	2	3	1	1	1	3	14	1	0	1	1	0	0	0	0.5	.	500	1	0.5	1	4	0
82	671427d	33	6	2	3	1	2	1	3	21	0	0	1	0	0	0	0	1	0	100	2	0	0	4	0
83	642457d	37	2	1	3	6	1	1	3	9	1	0	1	0	0	0	0	10	.	100	2	0.5	1	4	0
84	666058c	56	3	2	2	1	1	2	3	10	0	0	0	0	0	0	0	1	180	200	1	0	0	4	0
85	667196d	53	3	2	2	1	3	1	3	12	0	0	1	0	0	0	0	1	60	200	2	0	0	4	0
86	667132d	55	15	1	5	4	1	2	3	15	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
87	668119d	48	2	1	3	1	3	1	3	4	0	0	0	0	0	0	0	0.5	.	250	2	0	0	4	0
88	666892d	55	2	1	3	6	1	1	3	5	0	0	1	1	0	0	0	1	.	250	2	0.66	1	4	0
89	671099d	31	5	1	3	2	1	1	3	5	0	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
90	668133d	52	12	1	3	4	1	1	3	28	0	0	0	1	0	0	0	5.5	.	500	2	1	0.5	4	0
91	670281d	68	3	1	3	1	0	1	3	6	0	0	0	0	0	0	0	1	.	250	2	0.1	1	4	0
92	671164d	60	3	1	1	3	1	6	3	8	0	0	0	0	0	0	0	3	.	0	2	0	0	3	1
93	671966d	44	8	1	3	6	1	1	3	9	0	0	0	0	0	0	0	3	.	0	2	0	0	4	0
94	670499d	66	3	1	3	1	12	2	3	7	0	0	1	0	0	1	0	0.5	.	200	1	0	0	4	0
95	670918d	45	2	2	3	1	0	1	3	16	0	0	0	1	0	0	0	0.5	0	150	2	0	0	1	1
96	677470d	50	1	2	1	1	1	2	3	10	0	0	0	0	0	0	0	0.5	60	0	2	0	0	4	0
97	679096d	69	6	1	4	1	1	2	3	19	0	0	0	0	0	0	0	1.5	.	0	1	0	0	4	0
98	677285d	59	11	1	3	1	12	2	3	17	0	0	1	1	0	0	0	0.5	.	500	1	0	0	4	0
99	670091d	32	2	1	5	4	0	1	3	7	0	0	1	0	0	0	0	0.5	.	200	2	2.5	9	4	0
100	672811d	43	3	1	5	6	1	2	3	12	1	0	0	1	0	0	0	1	.	200	2	2	15	4	0
101	681766d	27	2	2	3	1	18	4	3	8	0	0	0	0	0	0	0	0.5	0	0	2	0.5	15	4	0
102	694754d	42	2	1	3	6	2	1	3	12	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
103	688577d	51	3	1	5	4	1	2	3	26	0	0	0	0	0	0	0	0.5	.	1000	2	0	0	4	0
104	696229d	46	2	1	2	2	3	1	3	15	0	0	0	0	0	0	0	6	.	0	2	0	0	1	1.5
105	691477d	57	2	1	5	6	3	1	3	10	0	0	0	0	0	1	0	1	.	200	2	2	5	1	0.66
106	696185d	60	2	1	3	1	3	5	3	26	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
54	0	0	0	0	22	11	4	168	119	43	90	8	4	.	261	67	15	4	0.938	0.1	1	0	0	.	.	.
55	1500	0.6	0	0	27	9	6	.	.	.	.	9	6	18	662	71	25	4	.	.	1	0	0	.	.	.
56	1500	0.5	1	1	17	9	11	130	34	46	74	6	7	14	877	85	22	4	.	.	3	2	2	.	.	.
57	0	0	1	0	24	9	5	121	99	28	61	9	4	17	1306	309	28	5	0.83	-0.7	1	0	2	.	.	.
58	0	0	1	0	25	7	4	126	56	42	66	7	5	13	532	77	25	3	.	.	0	0	0	.	.	.
59	0	0	3	3	22	8	3	157	141	25	93	8	4	19	339	89	32	4	.	.	2	1	0	.	.	.
60	1500	2	3	25	23	10	6	271	274	32	164	9	5	24	230	85	21	4	0.604	-2.4	3	1	2	.	.	.
61	0	0	3	3	28	12	2	185	119	36	128	9	4	23	315	87	11	4	.	.	5	3	1	2	2	2
62	0	0	0	0	19	9	7	140	58	59	65	8	6	16	385	144	26	4	.	.	1	0	0	.	.	.
63	1000	0.6	0	0	18	8	4	134	85	37	67	8	3	28	123	43	33	4	0.646	-2.1	0	0	0	.	.	.
64	0	0	3	0	25	10	3	146	70	49	88	9	5	20	636	81	29	5	.	.	.	.	2	.	.	.
65	1000	0.1	6	0	17	6	11	184	155	48	102	6	9	13	1761	95	24	4	.	.	3	1	0	.	.	.
66	0	0	9	9	26	11	4	147	137	32	76	7	5	19	509	71	36	4	.	.	.	.	1	1	1	1
67	1000	0.5	0	0	25	9	14	137	89	63	44	9	5	15	303	119	23	3	.	.	2	1	0	.	.	.
68	0	0	10	10	22	9	9	.	.	.	.	9	6	16	378	98	16	3	.	.	2	1	1	2	2	2
69	500	1	8	1	25	6	4	90	65	39	39	9	5	17	195	70	23	3	0.758	-1.3	4	2	0	.	.	.
70	0	0	7	7	27	10	5	143	100	45	66	8	6	17	1066	93	14	4	0.671	-1.6	1	0	0	.	.	.
71	0	0	0	0	21	13	4	115	107	32	59	8	5	20	152	62	22	5	1.06	1	.	.	0	.	.	.
72	0	0	5	5	25	10	5	145	158	30	79	9	5	13	731	91	32	4	0.838	-0.7	.	.	0	.	.	.
73	0	0	0	0	17	8	12	128	59	58	55	8	8	14	360	76	19	4	0.678	-1.9	0	0	0	.	.	.
74	0	0	0	0	21	9	16	164	200	36	85	8	7	28	236	63	27	4	0.934	0	6	4	0	.	.	.
75	1000	1	3	0	24	8	4	124	117	34	68	9	4	21	67	44	38	4	0.951	-0.4	0	0	0	.	.	.
76	0	0	0	12	27	9	10	139	80	45	67	7	5	20	0.9	99	19	4	0.676	-1.9	2	1	0	.	.	.
77	0	0	3	3	21	7	8	160	135	68	58	7	7	15	599	162	18	3	0.566	-2.7	1	0	0	.	.	.
78	0	0	3	0	26	8	10	245	306	35	142	9	5	24	280	103	16	4	0.863	0.1	.	.	0	.	.	.
79	1000	1	10	0	22	11	4	223	231	29	132	9	5	19	1036	208	25	4	0.667	-1.9	3	2	0	.	.	.
80	0	0	3	0	27	13	3	138	137	27	76	8	4	21	225	.	20	4	0.469	-3.4	0	0	0	.	.	.
81	1000	1	5	0	16	7	4	144	69	44	81	8	6	17	230	60	30	4	0.59	-2.3	.	.	0	.	.	.
82	0	0	0	0	25	10	3	142	261	29	71	9	3	20	281	133	16	5	0.755	-0.8	6	2	0	.	.	.
83	1000	0.5	1	0	20	7	6	332	148	37	239	9	5	.	75	85	23	4	0.701	-1.7	4	2	0	.	.	.
84	0	0	5	5	30	8	6	170	173	34	106	6	5	19	601	153	16	4	0.51	-3.1	.	.	1	1	2	2
85	0	0	5	0	27	8	5	210	93	44	163	5	7	17	470	314	12	4	0.647	-1.8	3	2	0	.	.	.
86	0	0	3	25	26	8	4	158	185	34	101	8	4	17	149	76	19	4	0.936	0	.	.	0	.	.	.
87	0	0	1	0	20	5	12	131	88	48	77	7	7	15	709	88	25	4	0.76	-0.8	4	2	0	.	.	.
88	1000	0.7	5	0	25	8	11	100	103	25	60	8	6	16	587	83	22	3	0.643	-2.1	2	1	0	.	.	.
89	0	0	0	0	19	7	14	191	92	44	131	8	7	15	373	74	30	4	0.932	0	.	.	0	.	.	.
90	0	0	2	0	21	11	3	120	98	34	67	8	4	22	26	61	28	4	0.639	-2.1	6	3	0	.	.	.
91	1000	0.1	0	0	.	11	10	145	231	30	77	9	5	20	113	67	32	4	0.711	-1.6	.	.	0	.	.	.
92	0	0	0	0	19	7	7	82	43	26	44	8	7	11	285	45	34	4	0.71	-1.6	6	3	0	.	.	.
93	0	0	3	0	27	10	7	186	259	24	115	8	4	17	255	107	20	4	0.742	-1.4	.	.	0	.	.	.
94	0	0	5	5	23	10	8	.	.	.	.	8	8	13	496	69	21	4	0.564	-2.7	7	3	1	2	3	3
95	1500	1	0	0	23	9	4	146	109	32	92	8	3	18	538	177	16	4	0.639	-1.9	.	.	0	.	.	.
96	0	0	15	1	30	11	5	175	272	34	97	9	5	18	256	118	8	3	0.7	-1.3	5	2	0	.	.	.
97	0	0	6	6	25	9	4	133	143	39	69	9	5	17	110	97	17	4	0.445	-3.6	5	2	0	.	.	.
98	0	0	5	20	22	9	4	175	105	45	110	.	.	16	391	170	10	3	0.555	-2.8	2	1	0	.	.	.
99	0	0	0	0	22	10	9	124	178	22	74	7	6	16	239	87	26	5	0.993	0.5	9	4	0	.	.	.
100	0	0	1	6	31	8	6	.	.	.	.	8	6	19	182	121	20	4	0.935	0	7	3	0	.	.	.
101	1000	0.5	0	0	18	7	7	151	63	54	89	8	6	20	60	66	21	4	0.839	-0.1	8	3	2	.	.	.
102	0	0	1	0	16	10	5	168	104	62	68	8	3	28	70	116	25	5	0.771	-1.2	5	3	0	.	.	.
103	0	0	3	18	24	10	3	167	274	30	93	9	4	25	201	121	15	3	0.646	-2.1	4	2	0	.	.	.
104	1000	1.5	0	0	17	9	4	135	80	35	83	9	4	23	79	71	23	4	0.614	-2.3	5	3	0	.	.	.
105	1000	0.7	15	0	23	11	6	65	76	27	29	8	4	.	247	.	15	5	0.573	-2.6	5	2	1	2	2	2
106	0	0	0	0	18	10	3	124	91	38	67	9	3	21	29	97	29	4	0.639	-2.1	5	3	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
107	624075d	41	2	2	5	1	3	1	3	3	1	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
108	587594d	47	2	1	3	4	6	1	3	28	1	0	0	0	0	1	0	1	.	0	2	0	0	4	0
109	622383d	55	2	1	3	3	12	2	3	10	0	0	1	0	0	0	1	7	.	0	2	0	0	4	0
110	617925d	15	2	2	3	1	0	1	3	29	0	0	0	0	0	0	0	1	.	100	1	1	15	4	0
111	622827d	51	10	2	5	1	12	1	3	11	0	0	1	0	0	0	0	0.5	48	0	1	1	30	4	0
112	628794d	56	2	1	3	3	3	1	1	4	1	0	0	0	0	1	0	1	.	500	2	0	0	4	0
113	627706d	56	3	1	3	6	1	1	3	6	0	0	0	0	0	0	0	1.5	.	200	2	0.5	3.5	2	0.5
114	619150d	51	2	1	1	4	1	1	3	9	0	0	0	0	0	1	0	7	.	0	2	0	0	1	0.24
115	627506d	42	2	1	3	6	2	1	1	4	0	0	0	0	0	0	0	1.5	.	200	2	0.5	3.75	4	0
116	629460d	46	10	2	3	1	6	1	3	12	1	0	0	0	0	0	0	1.5	0	0	1	0	0	4	0
117	647558d	30	3	2	5	1	0	1	3	15	0	0	1	0	0	0	0	0.5	0	250	2	0.5	3.75	1	0.5
118	646038d	36	2	1	2	2	0	1	3	11	1	0	0	1	0	0	0	1	.	0	2	1	30	4	0
119	626336d	53	2	1	3	6	3	2	3	20	0	0	0	0	0	1	0	1.5	.	200	2	0	0	4	0
120	650484d	63	3	1	3	1	2	2	3	9	1	0	0	1	0	1	0	1	.	300	2	0	0	4	0
121	619985d	59	2	1	6	6	0	1	3	7	0	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
122	621867d	16	16	1	3	1	1	1	1	10	0	0	0	0	0	0	0	2	.	100	2	0.5	2.5	3	0.5
123	618374d	54	6	2	1	1	6	1	3	26	1	1	1	1	0	0	0	0.5	60	0	2	0	0	4	0
124	621281d	43	5	2	5	7	36	2	3	5	0	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
125	600078d	43	2	2	6	1	6	4	3	14	1	0	0	0	0	0	0	0.5	0.1	0	2	0	0	4	0
126	615581d	58	1	2	5	4	12	1	3	11	0	0	0	0	0	0	0	0.5	120	200	1	0.66	20	1	0.6
127	621445d	37	2	1	2	2	1	1	1	3	0	0	0	1	0	0	0	5	.	0	2	0	0	1	0.3
128	623752d	52	15	1	5	5	1	2	3	21	0	0	1	0	0	0	0	5	.	500	2	0.5	3.5	4	0
129	627275d	40	2	1	3	6	2	1	3	6	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
130	624971d	56	2	2	3	1	4	2	3	14	0	0	0	0	0	0	0	0.5	60	200	1	0	0	4	0
131	627030d	62	3	1	3	1	2	2	1	9	1	0	0	0	0	0	0	1	.	200	2	0.5	3.5	2	0.5
132	624265d	45	6	1	6	6	1	2	3	20	0	0	0	0	0	0	0	1.5	.	250	2	0	0	2	0.3
133	630844d	37	8	2	3	1	2	1	3	3	0	0	0	0	0	0	0	1	0	0	2	1	7.5	4	0
134	646067d	51	11	1	3	5	1	2	3	30	0	0	1	0	0	1	0	0.5	.	250	2	0	0	4	0
135	647606d	60	2	1	2	6	2	5	3	23	1	0	0	0	0	1	0	0.5	.	0	2	0	0	4	0
136	649752d	38	8	1	3	2	3	1	3	6	0	0	1	1	0	0	0	5.5	.	100	2	1	3.75	4	0
137	650076d	59	2	1	3	4	3	2	3	18	1	0	0	1	0	0	0	1	.	300	1	0.3	5	4	0
138	650207d	35	10	1	3	4	1	2	1	7	0	1	1	0	1	0	0	0.5	.	150	1	0	0	4	0
139	650498d	80	3	1	3	1	0	1	3	8	1	0	1	1	0	0	0	0.5	.	250	2	1	3.75	1	1
140	650604d	45	2	2	3	1	0	1	3	9	0	0	0	0	0	0	0	3	0	200	1	0	0	1	1
141	621553d	37	2	2	5	1	3	1	3	8	1	0	0	0	0	0	0	1	0	200	2	2	30	4	0
142	617403d	38	2	1	3	6	12	2	3	15	0	0	0	0	0	0	0	2.5	.	0	1	0	0	4	0
143	621210d	57	3	1	5	4	2	1	3	8	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
144	613713d	47	9	1	5	4	1	1	3	13	1	0	0	0	0	0	0	1.5	.	100	2	0	0	2	0.3
145	618027d	30	2	2	3	1	1	1	3	20	0	0	0	0	0	0	0	0.5	0	100	2	0	0	4	0
146	251544b	50	2	1	5	4	0	4	3	26	1	0	1	1	0	0	0	2.5	.	0	2	0	0	4	0
147	618962d	37	6	2	2	1	2	1	3	6	1	0	0	1	0	0	0	0.5	120	200	2	1	7.5	4	0
148	619048d	27	8	1	5	1	6	1	3	3	1	0	1	1	0	0	0	1.5	.	250	2	0	0	4	0
149	618970d	47	1	1	3	6	24	2	3	4	1	0	1	1	0	0	0	0.5	.	0	1	0	0	4	0
150	618874d	53	13	1	4	3	2	1	3	17	0	0	0	0	0	1	0	7	.	500	1	0	0	2	0.3
151	617658d	34	8	1	2	1	3	1	3	3	0	0	0	0	0	0	0	2	.	250	2	0	0	4	0
152	662540d	24	2	1	5	2	2	1	3	9	1	0	0	0	0	0	0	6	.	0	2	0	0	1	2
153	662266d	38	2	2	6	5	0	4	3	7	0	0	0	0	0	0	0	2	0	200	2	0	0	4	0
154	621410d	29	2	1	5	5	1	1	3	7	1	0	0	0	0	0	0	0.5	.	100	2	0.3	1.75	1	0.3
155	636656d	53	3	2	2	1	36	2	3	14	0	0	0	1	0	0	0	0.5	120	100	2	0	0	4	0
156	716076d	37	6	1	5	5	3	1	3	14	0	0	0	0	0	0	0	0.5	.	200	2	2	15	1	2
157	751158d	43	3	2	2	1	3	1	3	11	1	0	0	0	0	0	0	0.5	0	500	1	1	7.5	4	0
158	756798d	26	1	1	2	2	0	1	3	23	0	0	0	0	0	0	1	4	.	0	2	0	0	4	0
159	755563d	37	2	2	3	1	1	1	3	13	0	0	0	0	0	0	0	3	0	0	1	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
107	0	0	8	0	22	4	16	108	159	26	47	5	10	10	808	92	20	5	0.656	-1.7	1	1	0	.	.	.
108	0	0	10	0	20	13	3	162	202	32	97	9	4	27	161	78	19	5	0.572	-2.6	.	.	0	.	.	.
109	0	0	1	7	23	7	6	174	58	53	99	8	5	17	160	63	18	3	0.792	-1	5	2	0	.	.	.
110	500	1	0	0	14	8	2	143	61	48	82	5	6	13	697	310	12	4	0.507	.	4	2	0	.	.	.
111	1000	1	28	0	26	7	4	133	68	51	27	9	4	16	317	92	54	3	0.553	-2.7	2	1	0	.	.	.
112	0	0	0	0	19	7	14	175	253	17	64	6	7	14	296	157	18	4	0.727	-1.5	3	2	0	.	.	.
113	0	0	5	0	21	10	10	124	106	24	74	5	6	18	671	172	11	4	0.557	-2.7	3	2	0	.	.	.
114	1000	0.3	0	0	23	8	7	202	211	40	122	9	4	19	443	132	30	5	0.846	-0.6	3	2	0	.	.	.
115	1500	0.5	1	0	24	8	16	125	115	29	76	8	6	25	357	63	19	4	0.688	-1.8	.	.	0	.	.	.
116	0	0	1	0	36	8	4	103	84	36	48	9	6	19	159	100	16	4	0.751	-0.9	4	1	0	.	.	.
117	1000	0.5	0	0	18	8	4	107	67	40	58	7	5	12	721	90	21	4	0.568	-2.5	4	2	0	.	.	.
118	1000	1	5	0	20	9	6	153	45	46	76	9	5	18	0.9	.	.	4	.	.	.	.	2	.	.	.
119	0	0	1	6	19	10	3	163	83	38	102	8	3	22	722	122	12	4	0.495	-3.2	.	.	0	.	.	.
120	500	0.3	3	1	21	9	7	231	89	53	126	8	5	23	513	70	19	3	0.72	.	5	3	0	.	.	.
121	0	0	10	15	22	9	8	150	50	57	67	8	6	22	232	61	20	4	0.724	-1.5	.	.	2	.	.	.
122	0	0	0	0	21	6	8	117	147	27	30	9	4	17	274	131	15	3	1.17	.	7	3	0	.	.	.
123	0	0	10	10	.	10	2	300	349	38	177	8	5	22	133	72	.	5	0.416	-3.9	1	1	0	.	.	.
124	0	0	3	5	27	9	9	122	70	42	61	8	4	19	296	.	.	4	.	.	4	2	2	.	.	.
125	0	0	1	0	21	9	4	230	96	70	133	9	4	22	79	56	11	4	0.725	-1.1	1	1	0	.	.	.
126	1000	0.6	0	0	32	9	5	192	134	34	121	8	3	15	1241	264	5	4	0.512	-3	1	1	0	.	.	.
127	1000	0.3	0	0	27	6	7	171	72	67	66	8	7	17	696	150	17	4	0.631	-2.2	4	2	0	.	.	.
128	1500	0.5	2	12	23	9	3	188	208	34	113	8	4	19	71	163	12	3	0.699	-1.7	3	1	0	.	.	.
129	0	0	4	0	21	8	10	221	180	42	128	9	7	30	758	94	5	4	0.697	-1.7	0	0	0	.	.	.
130	0	0	3	10	26	10	5	235	190	59	127	8	4	23	740	162	4	4	0.444	-3.7	7	3	1	4	4	5
131	0	0	3	22	20	11	5	197	250	27	104	9	6	18	53	546	16	4	0.735	-1.4	2	1	0	.	.	.
132	1000	0.3	1	10	21	9	4	260	182	40	173	9	3	22	96	149	11	2	0.709	-1.6	3	2	0	.	.	.
133	1000	1	2	0	22	7	20	168	143	25	108	8	9	9	261	130	23	5	0.857	0.1	2	1	0	.	.	.
134	0	0	3	10	21		2	109	95	36	45	9	3	29	45	74	17	3	0.708	-1.6	2	2	0	.	.	.
135	0	0	2	1	22	10	3	137	88	32	93	8	3	23	86	91	25	5	0.704	-1.7	4	3	0	.	.	.
136	0	0	0	0	24	7	10	178	207	25	116	8	6	16	155	80	30	4	.	.	.	.	0	.	.	.
137	1000	0.3	2	13	22	14	4	246	223	51	153	9	3	27	322	184	19	3	0.585	-2.5	6	3	0	.	.	.
138	0	0	8	8	38	10	8	.	.	.	.	8	5	18	265	78	.	3	.	.	.	.	2	.	.	.
139	1500	1	20	0	26	13	7	180	116	41	91	9	3	25	378	87	9	3	0.521	-3	7	4	1	4	6	8
140	1000	1	1	0	24	8	5	233	433	35	147	9	4	21	246	72	17	4	.	.	.	.	2	.	.	.
141	1000	2	0	0	24	9	6	166	85	41	91	8	6	19	357	56	24	4	0.86	0.1	5	3	0	.	.	.
142	0	0	1	10	24	9	5	240	653	26	100	8	3	20	459	195	29	5	.	.	.	.	0	.	.	.
143	0	0	12	0	18	5	8	190	128	79	76	6	6	9	601	65	15	3	.	.	5	3	0	.	.	.
144	0	0	6	0	24	10	5	219	169	33	114	9	3	22	257	132	23	4	0.662	-2	5	2	0	.	.	.
145	0	0	1	0	21	9	3	155	153	38	84	8	3	25	117	80	8	4	0.761	-0.8	3	2	0	.	.	.
146	0	0	7	14	24	10	3	213	184	47	121	10	4	25	16	43	15	4	0.694	-1.7	3	1	1	3	4	5
147	500	1	2	0	29	11	8	177	254	20	102	7	7	23	360	84	6	4	.	.	3	2	0	.	.	.
148	0	0	1	0	.	6	20	195	174	37	120	8	11	10	0.9	68	28	3	.	.	3	1	0	.	.	.
149	0	0	3	15	21	6	14	123	106	24	72	6	5	12	582	123	27	4	0.64	-2.1	.	.	2	.	.	.
150	0	0	5	1	23	11	4	136	103	47	42	9	5	30	27	72	24	4	0.875	-0.4	6	2	0	.	.	.
151	0	0	1	0	.	8	19	130	193	35	47	8	9	16	457	48	19	4	0.885	-0.3	.	.	0	.	.	.
152	1000	2	0	0	18	10	8	.	.	.	.	.	.	.	180	.	21	4	0.727	-1.5	6	3	0	.	.	.
153	0	0	0	0	24	9	7	220	175	37	159	9	5	.	341	68	11	3	0.66	-1.7	3	1	0	.	.	.
154	1000	0.3	1	0	25	9	10	168	126	41	97	7	8	19	422	71	6	4	0.795	-1	2	1	0	.	.	.
155	0	0	3	8	.	6	4	111	63	52	37	8	4	18	265	83	26	4	0.483	-3.3	3	3	0	.	.	.
156	1500	2	1	0	22	12	5	125	95	34	82	10	3	25	24	56	.	5	.	.	5	2	0	.	.	.
157	1000	1	1	0	25	8	5	106	118	27	61	8	4	16	0.9	.	.	4	.	.	.	.	2	.	.	.
158	0	0	0	0	17	13	4	.	.	.	.	9	4	24	114	84	25	4	.	.	.	.	2	.	.	.
159	0	0	7	0	22	11	4	225	163	43	158	9	5	27	222	.	.	3	.	.	4	1	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
160	752034d	66	2	1	3	3	1	1	3	11	0	0	0	0	0	0	0	6	.	0	1	2	15	4	0
161	748727d	31	6	1	5	5	0	1	3	26	0	0	0	1	0	0	0	0.5	.	250	1	2	7.5	1	2
162	750710d	31	6	1	3	4	1	1	3	13	0	0	0	1	0	0	0	3.5	.	500	2	1	15	4	0
163	758347d	42	6	1	5	4	4	2	3	12	1	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
164	760651d	20	5	1	3	1	1	5	3	12	0	0	0	0	0	0	0	3	.	200	2	0	0	1	1
165	760342d	33	3	1	3	3	4	1	3	2	0	0	0	0	0	0	0	3	.	0	2	0	0	4	0
166	745955d	24	5	2	3	7	6	6	3	9	0	0	0	0	0	0	0	1	.	0	2	1	0.5	4	0
167	738932d	70	5	1	5	1	3	1	3	16	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
168	745681d	40	2	1	2	1	2	1	3	6	0	0	0	0	0	0	0	5.5	.	0	2	0.66	5	1	0.66
169	738189d	72	2	1	3	1	2	2	3	27	0	0	0	0	0	0	0	1	.	100	2	0	0	4	0
170	733184d	39	2	1	5	4	1	2	3	12	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
171	736995d	35	3	2	2	1	2	2	3	28	1	0	0	0	0	0	0	0.5	0	200	2	0	0	4	0
172	728370d	52	1	2	3	1	0	1	3	28	0	0	0	0	0	0	0	0.5	0	100	2	0	0	4	0
173	716844d	67	1	2	3	1	6	1	3	20	1	0	0	0	0	0	0	1	60	250	2	0	0	4	0
174	732411d	58	3	1	6	4	1	2	3	6	0	0	1	0	0	0	0	1	.	200	2	0.5	3.75	3	0.5
175	733567d	57	11	2	3	1	6	1	3	18	1	0	0	1	0	0	0	0.5	72	0	1	1	3.75	4	0
176	730889d	57	12	1	5	4	1	6	3	16	0	0	0	1	0	1	0	1	.	200	2	0	0	4	0
177	731394d	16	1	2	3	1	2	1	3	7	1	0	0	1	0	0	0	1	0	100	2	0	0	4	0
178	729281d	45	2	1	3	6	10	2	3	20	0	0	0	0	0	0	0	1	.	500	2	0	0	4	0
179	730903d	56	2	1	5	4	1	1	3	29	0	0	0	0	0	0	0	1	.	0	2	0.5	3.75	4	0
180	687081d	63	2	1	3	1	6	2	3	23	0	0	0	1	0	0	0	1	.	250	2	0	0	4	0
181	726874d	48	3	1	3	3	2	1	3	29	0	0	0	0	0	0	0	1.5	.	500	2	0	0	4	0
182	730610d	46	2	1	3	6	1	1	3	5	0	0	0	0	0	0	0	2.5	.	100	2	0	0	4	0
183	727239d	58	2	1	5	5	0	1	3	26	1	0	0	0	0	1	0	3	.	500	2	0	0	4	0
184	729115d	59	6	2	2	1	7	1	3	8	1	0	0	1	0	0	0	0.5	144	500	2	0	0	4	0
185	761775d	62	6	1	2	1	2	1	3	20	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
186	761842d	60	2	1	3	1	1	1	1	9	0	0	1	1	0	0	0	0.5	.	0	2	0	0	1	1
187	761379d	44	3	2	2	1	3	1	3	7	0	0	0	0	0	0	0	0.5	0	200	2	2	15	1	2
188	727211d	55	2	1	2	1	2	1	1	7	0	0	0	0	0	1	0	0.55	.	200	2	0	0	4	0
189	721966d	67	5	1	6	1	2	1	3	12	0	0	0	0	0	1	0	2.5	.	400	2	0	0	4	0
190	727176d	44	2	2	3	4	1	1	3	8	0	0	0	0	0	0	0	0.5	0	0	2	0	0	1	1
191	731359d	38	2	2	3	1	1	1	3	7	1	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
192	102837d	61	3	1	5	4	0	2	3	26	0	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
193	745907d	48	2	2	4	1	0	2	3	5	0	0	0	1	0	0	0	0	24	0	2	0	0	4	0
194	749245d	52	16	1	3	4	2	1	1	5	0	0	1	1	0	0	0	5	.	300	2	0.5	3.75	4	0
195	717281d	56	13	1	5	6	0	1	3	12	1	0	0	1	0	0	0	0.5	.	100	2	0	0	4	0
196	745398d	46	17	1	3	4	6	1	3	19	1	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
197	734041d	65	11	1	3	1	1	2	3	8	0	0	0	0	0	0	0	0.5	.	250	2	1	7.5	4	0
198	743393d	54	12	1	3	4	6	1	3	23	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
199	734173d	46	3	1	5	6	0	1	3	9	0	0	0	0	0	0	0	3	.	500	2	0	0	2	0.5
200	740957d	55	2	1	2	6	2	2	3	9	1	0	1	1	0	1	0	0.5	.	250	2	0	0	4	0
201	745791d	24	2	1	3	2	1	1	3	9	0	0	0	0	0	1	0	2.5	.	200	2	0.5	3.75	4	0
202	740435d	30	8	1	3	3	12	1	3	2	1	0	1	1	0	0	0	8	.	250	2	1	7.5	4	0
203	740575d	58	2	1	3	1	9	2	3	22	1	0	0	1	0	0	0	4.5	.	250	2	0	0	4	0
204	741098d	40	2	1	3	6	3	1	3	8	1	0	0	1	0	1	0	0.5	.	0	2	0	0	4	0
205	758436d	29	2	1	3	2	1	1	3	6	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
206	474187d	60	5	1	6	1	0	1	3	28	0	0	0	0	0	1	0	2	.	100	2	0	0	4	0
207	741923d	48	9	1	5	4	0	1	3	28	0	0	0	1	0	0	0	0.5	.	200	1	0	0	4	0
208	747406d	36	2	2	3	1	4	1	3	9	1	0	1	0	0	0	0	0.5	0	0	2	2	7.5	3	2
209	751138d	55	2	2	3	1	0	1	3	17	1	0	0	1	0	0	0	0.5	0	250	1	0	0	4	0
210	752432d	29	2	1	3	1	1	1	3	3	0	0	0	1	0	1	0	0.5	.	0	1	0	0	1	1
211	752075d	32	2	1	3	1	1	1	3	27	0	0	1	1	0	0	0	0.5	.	0	1	0	0	4	0
212	752503d	54	2	1	3	4	1	2	3	6	1	0	1	1	0	0	0	0.5	.	200	2	1	7.5	1	1

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
160	0	0	10	2	30	8	6	102	125	27	56	8	5	17	0.9	.	.	5	.	.	6	2	0	.	.	.
161	1000	2	2	0	23	12	3	.	.	.	.	8	3	26	106	73	18	5	.	.	.	.	0	.	.	.
162	1000	1	1	0	23	11	6	102	171	29	45	9	5	22	0.9	.	.	4	.	.	.	.	2	.	.	.
163	0	0	3	3	21	9	6	135	157	35	73	9	6	12	40	.	23	4	.	.	.	.	2	.	.	.
164	1500	1	0	0	18	9	6	.	.	.	.	9	5	17	317	.	20	4	.	.	.	.	0	.	.	.
165	0	0	0	0	.	5	30	.	.	.	.	4	9	12	0.9	.	.	4	.	.	.	.	2	.	.	.
166	1000	1	1	0	19	11	6	.	.	.	.	8	3	19	349	91	39	4	.	.	7	2	0	.	.	.
167	0	0	0	30	14	8	4	91	88	27	43	9	4	17	76	75	42	4	.	.	.	.	0	.	.	.
168	1000	0.7	0	0	22	8	10	109	69	39	57	8	5	24	0.9	.	.	5	.	.	.	.	2	.	.	.
169	0	0	0	7	18	12	3	143	88	45	78	8	4	26	127	143	.	3	0.879	-0.4	8	4	0	.	.	.
170	0	0	1	5	23	12	6	165	179	31	106	9	5	24	250	87	15	4	.	.	6	3	0	.	.	.
171	0	0	1	7	27	9	2	337	371	34	237	8	5	12	556	201	17	2	.	.	2	1	0	.	.	.
172	0	0	3	0	24	12	2	192	303	35	116	9	2	28	70	105	15	5	.	.	9	4	0	.	.	.
173	0	0	0	0	29	11	3	220	141	42	157	9	3	25	254	117	20	4	.	.	6	2	1	1	1	2
174	1500	0.5	7	3	22	9	10	106	73	32	52	9	6	19	642	.	.	4	.	.	.	.	2	.	.	.
175	0	0	20	0	17	9	3	120	122	57	47	9	4	22	349	66	13	4	.	.	5	2	0	.	.	.
176	0	0	1	0	20	8	4	141	83	38	85	8	4	14	314	105	.	4	.	.	4	2	0	.	.	.
177	0	0	0	0	17	7	8	142	71	61	70	7	5	10	1324	.	.	4	.	.	.	.	2	.	.	.
178	0	0	13	13	27	8	4	175	229	25	110	.	.	.	0.9	85	.	4	.	.	.	.	2	.	.	.
179	500	0.5	8	0	22	13	3	248	247	34	177	9	3	24	0.9	.	.	4	.	.	.	.	2	.	.	.
180	0	0	8	8	20	7	3	185	201	40	110	8	4	.	59	114	17	4	.	.	.	.	2	.	.	.
181	0	0	2	12	23	11	3	287	109	57	200	9	5	25	47	81	18	3	.	.	4	1	0	.	.	.
182	0	0	1	0	23	7	13	.	.	.	.	6	7	14	1036	121	17	4	.	.	.	.	2	.	.	.
183	0	0	3	14	23	9	3	152	95	47	85	9	4	20	0.9	.	.	3	.	.	.	.	2	.	.	.
184	0	0	15	0	18	10	6	216	158	34	148	9	6	21	0.9	.	.	4	.	.	11	4	0	.	.	.
185	0	0	0	0	23	4	3	52	78	14	25	10	5	18	24	66	22	3	0.638	-2.1	6	3	0	.	.	.
186	1000	1	8	0	20	9	9	.	.	.	.	9	6	16	281	.	.	4	0.71	-1.3	.	.	2	.	.	.
187	1500	2	0	0	21	8	7	160	124	49	97	8	5	15	476	155	28	4	0.521	-3	6	3	0	.	.	.
188	0	0	0	0	21	8	8	195	77	43	125	8	5	15	233	73	29	4	0.843	-0.6	.	.	0	.	.	.
189	0	0	1	0	20	10	5	132	120	26	84	8	4	21	240	88	29	5	0.611	-2.8	6	3	0	.	.	.
190	1500	1	4	0	28	11	.	121	80	35	69	9	4	23	334	90	21	5	0.804	-0.4	6	3	0	.	.	.
191	0	0	2	0	19	6	7	228	135	52	140	8	5	15	0.9	.	.	4	0.624	-2	6	3	0	.	.	.
192	0	0	5	15	25	9	3	97	64	35	48	8	4	16	283	108	12	4	0.61	-2.4	.	.	0	.	.	.
193	0	0	5	7	25	9	.	165	159	37	105	9	5	19	335	119	27	3	0.731	-1.1	4	2	0	.	.	.
194	0	0	2	0	19	6	12	103	140	17	52	8	4	16	367	.	23	2	0.646	-2.1	9	4	0	.	.	.
195	0	0	15	0	21	9	5	75	74	22	40	8	3	16	83	77	33	4	0.629	-2.2	7	3	0	.	.	.
196	0	0	5	0	33	9	4	152	144	35	91	8	4	29	348	66	15	4	0.77	-1.2	6	2	0	.	.	.
197	1000	1	15	15	20	9	7	135	137	42	75	8	6	25	619	.	17	3	.	.	12	4	1	1	1	1
198	0	0	0	0	21	8	3	149	128	40	88	8	2	22	94	.	58	4	.	.	4	1	0	.	.	.
199	0	0	1	0	21	9	7	155	58	42	98	8	5	19	338	108	29	5	.	.	9	4	0	.	.	.
200	0	0	1	15	22	10	7	186	121	39	133	8	4	24	570	.	16	4	.	.	.	.	0	.	.	.
201	0	0	0	0	18	9	8	155	98	34	117	8	6	14	0.9	.	.	4	.	.	.	.	2	.	.	.
202	0	0	1	0	17	8	25	102	163	26	51	8	12	12	0.9	.	.	4	.	.	.	.	2	.	.	.
203	0	0	5	5	26	9	3	165	208	30	102	9	4	22	154	110	31	5	.	.	2	1	0	.	.	.
204	0	0	6	0	26	8	8	121	90	39	62	5	5	.	584	103	18	5	.	.	5	3	0	.	.	.
205	0	0	0	0	21	9	11	117	138	27	71	5	8	16	406	.	18	4	.	.	.	.	0	.	.	.
206	0	0	4	12	25	10	3	169	154	28	104	9	4	14	98	.	.	4	.	.	.	.	2	.	.	.
207	0	0	0	10	27	10	2	196	134	36	138	8	3	23	137	85	19	5	.	.	.	.	2	.	.	.
208	0	0	4	0	31	10	6	103	65	30	73	8	6	13	376	85	15	4	.	.	7	3	0	.	.	.
209	0	0	0	0	23	9	3	202	186	32	141	8	4	16	683	.	19	5	.	.	5	2	2	.	.	.
210	1000	1	0	0	20	8	18	.	.	.	.	9	8	15	143	69	.	4	.	.	.	.	0	.	.	.
211	0	0	1	1	22	9	3	133	343	24	54	7	4	19	293	80	.	4	.	.	.	.	2	.	.	.
212	1000	1	1	3	.	6	10	.	.	.	.	8	6	.	467	126	15	3	.	.	11	4	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
213	751242d	43	2	1	2	3	1	1	3	10	0	0	0	0	0	1	0	8	.	300	2	1	7.5	4	0
214	748459d	35	8	1	2	2	2	1	1	4	0	0	1	0	0	0	0	6.5	.	0	2	0	0	4	0
215	756044d	66	2	2	3	1	2	2	3	23	1	0	1	1	0	0	0	0.5	264	200	2	0	0	4	0
216	752170d	65	1	1	3	1	0	1	3	26	0	0	0	0	0	0	0	0.5	.	100	2	0	0	4	0
217	756596d	42	2	1	5	5	6	2	3	6	0	0	0	1	0	0	0	4	.	0	1	0	0	4	0
218	736067d	32	3	1	5	1	1	1	3	4	0	0	0	0	0	0	0	3	.	0	2	1	3.75	1	1
219	735826d	69	2	2	4	1	1	2	3	16	1	0	0	0	0	0	0	1	24	100	2	0	0	4	0
220	727211d	55	2	1	2	1	2	1	1	7	0	0	0	0	0	1	0	0.5	.	200	2	0	0	4	0
221	724424d	33	16	1	2	3	6	1	1	7	0	0	1	0	0	0	0	0.5	.	0	2	0.3	5	4	0
222	729071d	47	6	1	3	3	1	2	3	8	0	0	0	0	0	1	0	8	.	250	2	0	0	4	0
223	766257d	62	6	1	3	3	6	5	3	7	0	0	0	0	0	0	0	2	.	250	2	0	0	4	0
224	729208d	65	2	1	3	1	24	2	3	28	0	0	0	0	0	1	0	2	.	0	2	0	0	4	0
225	729664d	36	2	1	3	6	0	1	3	20	0	0	0	0	0	0	0	7	.	0	2	0	0	4	0
226	732013d	58	2	2	3	1	3	2	3	17	0	0	0	0	0	0	0	0.5	.	100	2	0	0	4	0
227	732128d	35	18	1	5	6	1	1	3	18	0	0	0	0	0	1	0	1.5	.	200	2	0.3	5	4	0
228	737355d	22	2	2	3	1	3	1	3	23	1	0	1	1	0	0	0	0.5	.	100	1	1.5	11.3	4	0
229	736831d	50	6	1	5	4	1	1	3	6	0	0	1	1	0	0	0	2.5	.	500	2	0	0	1	0.5
230	731874d	48	12	2	3	1	3	1	3	5	0	0	0	1	0	0	0	0.5	18	500	2	1	15	4	0
231	738012d	53	2	2	2	1	12	2	3	7	1	0	1	0	0	0	0	0.5	72	0	2	1	7.5	4	0
232	738256d	56	3	1	5	1	2	1	3	10	1	0	0	1	0	0	0	0.5	.	200	2	0	0	4	0
233	738780d	50	2	2	2	1	24	1	3	16	0	0	0	0	0	0	0	0.5	24	0	2	0	0	4	0
234	734358d	45	1	2	3	2	0	1	3	15	1	0	0	1	0	0	0	0.5	0	200	2	0	0	4	0
235	737580d	45	3	1	3	6	2	2	3	7	0	0	0	1	0	0	0	6	.	200	2	0.5	3.75	1	0.5
236	737371d	48	3	1	6	7	1	1	3	3	0	0	0	1	0	1	0	2.5	.	250	1	0.3	2.5	1	0.3
237	732730d	40	18	2	2	1	1	2	3	11	0	0	0	1	0	0	0	0.5	0	100	1	0	0	4	0
238	733028d	65	2	1	2	1	12	1	3	13	0	0	0	0	0	0	0	8	.	500	1	0	0	4	0
239	731568d	50	11	1	3	4	0	1	3	25	1	0	0	1	0	0	0	0.5	.	0	2	0	0	4	0
240	722007d	52	2	1	3	6	2	2	3	17	0	0	0	0	0	0	0	0.5	.	250	2	0	0	4	0
241	877257b	37	2	1	3	3	1	1	3	13	0	0	0	0	0	0	0	8	.	0	2	0	0	1	0.5
242	721513d	40	3	2	3	1	0	1	3	12	0	0	0	0	0	0	0	0.5	0	200	1	0.5	7.5	4	0
243	725495d	50	6	2	1	1	2	1	3	4	1	0	1	1	0	0	0	0.5	60	100	2	0.3	1.75	1	0.3
244	729823d	43	2	1	3	4	3	1	3	6	1	0	0	0	0	0	0	0.5	.	500	2	0	0	4	0
245	726040d	55	2	1	3	4	0	2	3	17	0	0	0	0	0	0	0	1	.	0	2	0	0	2	1
246	726797d	35	6	2	3	1	1	1	3	15	0	0	0	0	0	0	0	0.5	0	100	2	0	0	4	0
247	731610d	56	2	1	2	2	2	1	3	14	0	0	0	0	0	0	0	8	.	100	2	0	0	4	0
248	738597d	45	1	1	5	5	4	1	3	4	0	0	1	0	0	0	0	0.5	.	500	2	0	0	1	0.3
249	750907d	13	1	1	3	1	2	1	3	10	1	0	0	0	0	0	0	1	.	150	2	1	7.5	4	0
250	759557d	52	5	1	6	5	1	2	3	13	1	0	1	1	0	0	0	0.5	.	50	2	0	0	4	0
251	752186d	32	2	1	5	6	3	1	3	9	1	0	1	0	0	0	0	2	.	0	2	0	0	4	0
252	749062d	60	3	1	3	6	1	1	3	11	0	0	1	0	0	1	0	1	.	100	1	2	18	3	2
253	750683d	42	3	1	3	3	0	1	3	14	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
254	743606d	60	6	1	5	1	3	2	3	12	0	0	0	0	0	1	1	0.1	.	0	2	0	0	4	0
255	743886d	58	2	1	3	6	1	2	3	23	1	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
256	751127d	67	2	1	5	1	2	1	3	18	0	0	0	0	0	1	0	0.5	.	100	2	0	0	4	0
257	747031d	55	9	1	5	4	6	1	3	8	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
258	749694d	30	6	1	2	2	2	1	3	6	0	0	0	1	0	0	0	11	.	500	2	1	7.5	4	0
259	748759d	25	3	2	3	1	1	1	3	8	0	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
260	757904d	54	6	2	3	1	3	2	3	15	1	0	1	0	0	0	0	0.5	72	100	2	0	0	2	0.5
261	748202d	56	2	1	3	6	1	2	3	10	0	0	0	0	0	0	0	0.5	.	500	2	1	15	4	0
262	757065d	55	19	1	3	6	1	1	3	8	0	0	1	0	0	0	0	0.5	.	100	1	0.5	7.5	4	0
263	745650d	59	1	1	5	1	3	1	3	11	0	0	1	1	0	0	0	0.5	.	150	2	0	0	4	0
264	752707d	72	3	1	5	1	0	2	3	28	0	0	0	0	0	0	0	3	.	400	2	0	0	4	0
265	755736d	52	6	2	2	1	5	2	3	20	1	0	0	0	0	0	0	0.5	120	250	1	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
213	500	1	1	0	17	7	7	.	.	.	.	7	5	.	266	102	46	4	.	.	5	2	0	.	.	.
214	0	0	1	0	23	7	16	111	97	31	66	8	7	14	0.9	.	.	4	.	.	.	.	2	.	.	.
215	0	0	0	20	35	8	3	115	106	48	49	7	4	21	0.9	.	.	4	.	.	.	.	2	.	.	.
216	0	0	15	10	.	11	3	173	128	32	120	8	4	23	114	.	.	5	.	.	.	.	2	.	.	.
217	0	0	1	15	23	7	10	.	.	.	.	9	6	10	186	132	12	3	0.597	-2.4	0	0	0	.	.	.
218	1500	1	0	0	20	8	15	129	84	31	84	6	10	12	408	.	19	3	0.962	-1.2	6	2	2	.	.	.
219	0	0	20	12	24	8	3	127	217	42	50	8	3	.	181	.	9	4	0.56	-2.6	.	.	0	.	.	.
220	0	0	0	0	21	8	8	195	77	43	125	8	5	15	233	73	29	4	0.843	-0.6	11	3	0	.	.	.
221	1000	0.3	0	0	20	8	9	145	194	27	87	8	5	19	168	84	22	3	0.865	-0.5	10	4	0	.	.	.
222	0	0	5	12	28	8	8	250	182	44	161	8	9	13	137	74	16	3	0.605	-2.4	6	3	2	.	.	.
223	0	0	10	0	21	7	15	.	.	.	.	7	5	.	625	124	16	4	.	.	.	.	2	.	.	.
224	0	0	0	5	18	8	3	.	.	.	.	8	3	23	86	203	21	3	0.685	-1.8	5	2	0	.	.	.
225	0	0	7	0	26	12	4	178	257	24	108	7	3	27	552	156	16	5	0.789	-1	.	.	0	.	.	.
226	0	0	15	15	25	7	3	186	386	30	99	8	4	18	211	111	23	4	0.59	-2.3	6	3	0	.	.	.
227	0	0	1	0	25	12	4	120	141	24	70	8	5	19	255	69	20	5	0.933	0	6	2	0	.	.	.
228	500	1.5	0	.	18	10	4	189	190	40	117	9	4	25	365	69	15	4	0.857	0.1	8	3	0	.	.	.
229	1000	0.5	0	0	25	6	9	122	150	50	49	4	8	10	414	296	14	4	0.668	-1.9	.	.	2	.	.	.
230	100	1	6	0	25	9	9	168	211	28	104	8	6	17	444	82	19	5	0.671	-1.6	5	2	0	.	.	.
231	0	0	10	10	22	8	7	116	56	42	65	12	6	.	2	49	22	4	0.773	-0.7	9	4	0	.	.	.
232	0	0	8	8	39	10	6	202	91	58	122	7	4	30	645	125	7	5	0.662	-2	.	.	2	.	.	.
233	0	0	0	0	22	8	3	203	138	38	134	9	3	23	482	91	18	4	0.564	-2.6	2	2	0	.	.	.
234	0	0	1	0	22	11	4	.	.	.	.	8	4	22	454	78	25	4	0.71	-1.3	3	2	0	.	.	.
235	100	0.5	2	4	20	10	8	135	133	48	60	8	6	16	504	.	33	3	0.624	-2.2	8	3	0	.	.	.
236	1500	0.3	1	0	28	8	16	96	165	23	48	5	8	15	662	191	.	5	0.754	-1.3	2	1	0	.	.	.
237	0	0	1	10	17	9	5	221	83	64	132	8	6	23	130	78	18	4	0.648	-1.8	.	.	2	.	.	.
238	0	0	10	0	18	6	5	94	98	39	35	9	6	13	77	.	.	4	0.612	-2.8	7	3	0	.	.	.
239	0	0	15	0	21	10	3	145	112	47	84	8	4	19	164	92	26	4	0.509	-3.1	.	.	2	.	.	.
240	0	0	1	1	20	9	4	168	77	62	86	9	4	21	279	60	12	4	0.575	-3	7	3	0	.	.	.
241	1000	0.5	0	0	18	10	5	123	204	21	67	10	5	16	17	72	32	4	0.667	-1.9	7	3	0	.	.	.
242	1000	0.5	0	0	24	11	4	137	75	46	72	8	5	21	742	73	13	4	0.722	-1.1	.	.	0	.	.	.
243	1500	0.3	0	0	19	9	10	201	193	22	146	11	6	23	3	.	10	5	0.589	-2.3	.	.	0	.	.	.
244	0	0	1	0	19	7	11	81	26	33	40	7	5	12	594	113	29	5	0.779	-1.1	2	2	2	.	.	.
245	0	0	1	10	24	11	4	200	125	39	134	9	3	26	206	107	10	3	0.769	-1.2	7	3	1	2	3	4
246	0	0	3	0	26	11	4	173	140	44	106	9	5	22	374	131	12	4	0.837	-0.1	8	3	0	.	.	.
247	0	0	10	0	19	8	5	135	52	46	72	8	5	25	326	71	30	4	0.756	-1.3	1	2	0	.	.	.
248	1000	0.3	8	0	19	6	16	142	115	34	94	5	7	10	1332	245	15	4	0.466	-3.4	9	3	0	.	.	.
249	500	1	0	0	15	5	8	.	.	.	.	9	7	.	1174	195	35	4	0.635	.	4	2	0	.	.	.
250	0	0	0	17	.	8	5	.	.	.	.	.	.	18	159	71	9	3	0.459	-3.5	.	.	0	.	.	.
251	0	0	0	0	19	11	6	.	.	.	.	9	4	.	170	84	21	4	0.801	-0.9	6	3	0	.	.	.
252	0	0	0	0	20	12	6	101	83	27	63	8	5	16	234	92	24	4	0.595	-2.5	5	3	1	1	1	1
253	0	0	5	0	.	9	5	104	72	35	57	8	5	17	316	122	19	4	0.882	-0.4	.	.	2	.	.	.
254	0	0	1	20	23	10	6	234	140	59	149	9	4	22	224	80	22	3	0.683	-1.8	6	3	0	.	.	.
255	0	0	20	20	31	8	3	168	196	31	103	8	3	19	245	108	14	3	0.686	-1.8	5	2	0	.	.	.
256	0	0	0	0	22	9	4	191	410	26	99	8	3	.	147	61	35	4	0.791	-1	4	2	0	.	.	.
257	0	0	9	0	26	9	8	117	47	58	45	8	5	16	0.9	98	25	3	0.572	-2.6	6	3	0	.	.	.
258	500	1	0	0	19	8	11	.	.	.	.	8	5	.	742	93	27	5	0.69	-1.8	.	.	2	.	.	.
259	0	0	0	0	21	9	7	172	134	43	108	9	5	16	1004	84	11	4	0.528	-2.9	.	.	2	.	.	.
260	0	0	5	20	26	10	3	264	283	51	166	9	4	24	123	123	13	4	0.677	-1.5	.	.	0	.	.	.
261	1000	1	2	15	24	9	6	.	.	.	.	8	5	23	200	87	21	5	0.845	-0.6	9	3	0	.	.	.
262	1000	0.5	6	0	20	8	7	.	.	.	.	9	6	13	129	75	20	3	0.688	-1.8	.	.	0	.	.	.
263	0	0	10	0	26	11	6	.	.	.	.	8	5	19	223	104	15	4	0.595	-2.5	4	2	0	.	.	.
264	0	0	10	10	20	10	2	.	.	.	.	9	3	27	37	73	24	4	0.705	-1.7	7	2	1	1	1	1
265	0	0	10	10	21	8	4	.	.	.	.	8	4	20	425	114	9	4	0.513	-3	4	1	1	3	5	10

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
266	733995d	47	2	1	3	7	0	1	3	8	0	0	0	1	0	0	0	0.5	.	250	1	0	0	4	0
267	737012d	21	3	2	5	1	2	1	3	19	1	0	1	1	0	0	0	0.5	0	200	1	1	15	4	0
268	759211d	26	18	2	5	7	6	1	1	2	0	0	0	0	0	0	0	0.5	0	200	2	0	0	4	0
269	761099d	60	2	1	2	1	1	2	3	11	1	0	0	1	0	0	0	0.5	.	500	2	0	0	4	0
270	763972d	37	2	1	3	3	1	1	1	4	0	0	0	0	0	0	0	3	.	200	2	0	0	2	0.5
271	671705d	69	2	2	2	1	1	1	3	3	1	0	1	1	0	0	0	0.5	240	250	2	0	0	1	2
272	671183d	48	18	2	3	1	2	2	3	18	0	0	0	1	0	0	0	0.5	120	500	2	0	0	4	0
273	679901d	59	2	1	3	3	3	2	3	6	0	0	0	0	0	1	0	1.5	.	0	2	0	0	4	0
274	677605d	51	1	1	5	7	36	2	3	6	0	0	0	0	0	0	0	0.5	.	200	2	0	0	4	0
275	679587d	29	3	1	6	1	1	1	1	5	0	0	0	0	0	0	0	1.5	.	0	2	0.5	3.25	1	0.5
276	679523d	36	6	1	3	3	1	1	3	10	0	0	0	0	0	0	0	5	.	200	2	0	0	4	0
277	677741d	38	8	1	6	6	0	1	3	9	0	0	1	0	0	1	0	0.5	.	100	2	1	22.5	4	0
278	678532d	62	2	1	4	1	12	1	3	5	0	0	0	0	0	0	0	1	.	200	2	0	0	4	0
279	688751d	30	2	1	3	7	1	1	3	4	1	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
280	672608d	25	2	1	3	7	6	1	3	11	0	0	0	0	0	0	0	0.5	.	0	2	1	7.5	1	1
281	672659d	47	2	1	2	6	1	1	3	6	0	0	0	0	0	0	0	4	.	50	2	0.5	3.25	1	0.5
282	681707d	29	3	2	3	1	1	1	3	6	1	0	0	1	0	0	0	0.5	.	200	1	0	0	2	0.3
283	697080d	39	3	2	2	1	12	1	3	5	1	0	0	0	0	0	0	1.5	0	0	1	0	0	1	0.3
284	693002d	58	2	1	3	4	3	1	3	2	1	0	1	0	0	0	0	0.5	.	0	2	0	0	4	0
285	675063d	50	16	1	4	3	1	1	3	9	0	0	0	0	0	1	1	3	.	0	2	0	0	4	0
286	655031d	33	2	1	5	6	1	1	3	7	0	0	0	0	0	0	1	3	.	0	2	0	0	4	0
287	673273d	59	2	1	3	4	0	1	3	8	0	0	0	0	0	0	0	1	.	100	2	0	0	4	0
288	673193d	52	15	1	3	6	8	2	3	9	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
289	665867d	54	2	2	2	1	3	3	3	15	1	0	1	0	0	0	0	0.5	224	0	2	0	0	4	0
290	694710d	55	3	1	3	4	3	1	3	13	0	0	0	0	0	0	0	1.5	.	100	2	0.5	7.5	4	0
291	695463d	43	3	2	6	1	1	1	3	8	0	0	0	0	0	0	0	0.5	.	350	2	0.5	3.25	4	0
292	695557d	51	20	1	6	4	12	2	3	15	0	0	0	0	0	0	0	1	.	200	2	0	0	4	0
293	697616d	49	3	1	3	6	3	1	3	25	0	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
294	698732d	61	1	1	3	1	1	1	3	7	0	0	0	0	0	0	0	1	.	100	2	0	0	4	0
295	612008d	44	2	1	1	3	36	2	3	20	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
296	627065d	49	21	1	5	4	6	1	3	7	0	0	0	0	0	0	0	1.5	.	0	2	0.25	0.75	1	0.25
297	626965d	22	2	2	3	1	6	1	3	2	0	0	1	1	0	0	0	0.5	6	0	2	0.3	5	4	0
298	629295d	57	2	1	3	4	3	2	3	16	0	0	1	0	0	0	1	1.5	.	200	2	0	0	4	0
299	627010d	57	3	1	5	4	1	2	3	26	0	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
300	627782d	38	3	2	3	1	1	1	3	25	0	0	0	0	0	0	0	1.5	0	0	2	0	0	4	0
301	680954d	41	6	2	4	4	6	1	3	15	0	0	0	0	0	0	0	1	36	100	1	0	0	4	0
302	683015d	52	3	1	6	4	1	1	3	2	0	0	0	0	0	0	0	1.5	.	100	2	0.5	1.62	1	0.5
303	682379d	52	2	2	5	4	0	1	3	11	0	0	0	0	0	0	0	0.5	0	50	2	1	15	1	1
304	677314d	43	2	2	1	1	1	3	3	21	0	0	1	1	0	0	0	1	0	0	2	1	15	4	0
305	676155d	61	3	1	3	3	2	1	3	21	0	0	0	0	0	0	0	0.5	.	500	2	0	0	4	0
306	680177d	36	1	2	4	1	6	1	3	6	1	0	0	0	0	0	0	1.5	0	200	2	2	15	4	0
307	676276d	44	2	1	3	7	1	2	3	8	0	0	0	0	0	1	0	2.5	.	0	1	0	0	4	0
308	681965d	35	2	2	3	1	12	1	3	5	0	0	0	1	0	0	0	0	0	0	2	1	22.5	4	0
309	682106d	61	2	2	6	1	6	2	3	8	0	0	0	0	0	0	0	0	156	500	2	1.5	25.3	4	0
310	672243d	24	16	2	3	1	6	1	3	18	0	0	0	0	0	0	0	1.5	36	0	2	0	0	4	0
311	202661d	57	2	1	5	7	10	2	3	22	1	0	0	0	0	0	0	0	.	250	2	0	0	4	0
312	689750d	30	10	1	3	6	0	1	3	6	0	0	0	0	0	0	0	1.5	.	100	1	1	22.5	4	0
313	692548d	68	2	1	3	1	1	1	3	10	1	0	0	0	0	1	0	1	.	0	2	0.3	2.5	4	0
314	673840d	18	3	2	5	1	6	1	3	7	0	0	0	0	0	0	0	1	0	0	1	0	0	4	0
315	678106d	45	6	1	4	6	1	2	3	9	0	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
316	668580d	52	2	2	3	1	0	2	3	16	0	0	0	0	0	0	0	0.5	108	400	2	0	0	4	0
317	676434d	67	2	1	3	1	0	1	3	16	0	0	1	0	0	0	0	0	.	0	2	0	0	4	0
318	677856d	49	3	1	3	7	24	2	3	12	0	0	1	1	0	0	0	5	.	250	2	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
266	0	0	0	0	22	10	7	168	166	24	116	8	5	20	245	117	15	4	0.465	-3.4	4	3	0	.	.	.
267	1000	1	0	0	18	8	3	130	160	33	74	9	5	24	280	104	25	3	0.862	0.1	8	3	0	.	.	.
268	0	0	1	0	16	10	23	.	.	.	.	8	9	10	602	39	.	4	.	.	.	.	2	.	.	.
269	0	0	10	10	21	8	6	.	.	.	.	8	5	16	250	.	15	4	0.549	-2.8	8	3	2	.	.	.
270	0	0	0	0	21	8	17	92	26	50	41	9	4	22	155	71	40	4	.	.	.	.	2	.	.	.
271	1500	2	10	0	21	8	7	128	131	35	77	8	5	16	60	45	17	4	.	.	.	.	2	.	.	.
272	0	0	2	20	23	7	4	168	210	26	103	8	4	17	226	171	12	3	.	.	9	4	0	.	.	.
273	0	0	2	2	15	7	10	135	70	47	73	8	5	13	0.9	.	.	4	.	.	.	.	2	.	.	.
274	0	0	3	3	26	9	10	113	98	32	66	6	5	17	1196	114	26	4	.	.	.	.	2	.	.	.
275	1000	0.5	2	0	23	8	12	128	95	33	71	6	6	16	866	112	8	4	.	.	.	.	2	.	.	.
276	0	0	1	0	21	12	6	140	93	39	82	8	6	15	213	100	23	5	.	.	.	.	0	.	.	.
277	1000	1	0	0	23	10	8	169	75	32	108	8	8	11	514	35	.	4	.	.	.	.	2	.	.	.
278	0	0	15	0	23	10	10	100	59	32	59	8	4	19	274	70	28	5	.	.	6	3	1	2	3	3
279	0	0	1	0	21	7	14	107	96	26	64	7	11	11	0.9	.	.	4	.	.	.	.	2	.	.	.
280	1000	1	1	0	25	7	7	115	152	38	56	8	4	14	191	100	.	4	.	.	.	.	2	.	.	.
281	1500	0.5	0	0	18	8	10	.	.	.	.	7	5	10	789	115	25	4	.	.	7	3	0	.	.	.
282	0	0	0	0	18	7	8	153	171	40	91	8	9	19	0.9	.	.	4	.	.	4	2	0	.	.	.
283	1000	0.3	0	0	22	7	10	.	.	.	.	8	6	16	1445	133	16	4	.	.	.	.	2	.	.	.
284	0	0	0	0	21	5	24	114	99	29	64	9	10	7	579	75	27	3	.	.	.	.	0	.	.	.
285	0	0	0	0	18	8	7	197	125	49	41	8	6	17	326	153	23	4	.	.	7	3	0	.	.	.
286	0	0	0	0	17	7	9	130	113	40	78	7	9	.	362	.	15	4	.	.	4	1	0	.	.	.
287	0	0	2	1	20	5	8	132	41	55	74	6	6	9	499	121	23	3	.	.	9	4	0	.	.	.
288	1000	0.3	1	10	26	11	7	195	158	34	139	8	5	19	959	108	13	3	.	.	6	2	0	.	.	.
289	0	0	1	0	20	11	3	.	.	.	.	8	4	25	154	68	28	4	.	.	7	3	1	1	1	2
290	1000	0.5	0	0	17	7	5	95	127	21	48	7	4	20	211	183	39	3	.	.	4	2	0	.	.	.
291	500	0.5	0	0	23	10	6	76	62	17	45	7	5	8	723	176	21	4	.	.	2	2	0	.	.	.
292	0	0	10	20	28	10	4	140	256	27	75	9	3	.	183	.	7	4	.	.	6	3	0	.	.	.
293	0	0	15	0	17	16	3	.	.	.	.	.	.	.	0.9	.	12	.	.	.	5	2	0	.	.	.
294	0	0	0	0	23	6	9	145	65	38	85	8	5	12	601	130	28	4	.	.	.	.	2	.	.	.
295	0	0	5	1	18	9	3	278	251	48	202	9	4	.	180	122	8	3	.	.	.	.	0	.	.	.
296	1000	0.3	6	0	22	9	9	209	238	29	133	9	6	17	330	78	26	4	.	.	5	2	0	.	.	.
297	500	0.3	0	0	19	3	23	167	162	29	73	7	15	16	561	56	12	3	.	.	1	1	0	.	.	.
298	0	0	5	10	19	11	4	155	129	50	69	8	3	22	674	248	7	3	.	.	5	2	0	.	.	.
299	0	0	2	14	.	9	3	181	95	34	121	8	4	21	195	156	6	3	.	.	.	.	2	.	.	.
300	0	0	1	0	19	10	2	179	80	56	93	9	4	15	134	126	13	4	.	.	.	.	0	.	.	.
301	0	0	15	0	22	8	3	.	.	.	.	8	5	16	823	130	8	4	.	.	5	2	0	.	.	.
302	1000	0.5	0	0	36	8	24	172	290	26	91	7	9	16	1010	130	.	5	.	.	.	.	2	.	.	.
303	1000	1	7	0	24	9	5	236	.	36	155	9	5	21	69	70	13	3	.	.	5	2	0	.	.	.
304	1000	1	20	0	31	10	3	179	102	56	105	9	4	.	149	99	26	4	.	.	.	.	2	.	.	.
305	0	0	3	0	21	10	3	163	181	30	99	8	3	24	232	70	19	4	.	.	6	3	1	1	1	1
306	0	0	0	0	24	7	9	.	.	.	.	8	5	13	1289	134	20	4	.	.	7	3	0	.	.	.
307	0	0	0	2	30	10	6	181	93	38	125	9	4	16	194	78	24	3	.	.	6	3	0	.	.	.
308	1000	1	0	0	22	9	10	136	72	36	79	9	5	22	317	83	21	4	.	.	.	.	2	.	.	.
309	1000	1.5	3	15	27	8	6	114	97	37	66	8	5	22	285	168	19	4	.	.	5	2	0	.	.	.
310	0	0	0	0	19	8	3	.	.	.	.	9	5	15	76	83	15	4	.	.	5	2	0	.	.	.
311	0	0	16	4	24	10	3	178	165	50	106	9	3	26	111	111	12	3	.	.	5	2	0	.	.	.
312	1500	1	0	0	21	9	10	70	53	21	38	7	6	13	433	138	18	4	.	.	4	2	0	.	.	.
313	500	0.3	12	0	16	8	6	135	125	38	76	9	6	12	337	98	14	4	.	.	4	2	1	4	5	8
314	0	0	1	0	16	7	8	103	92	35	55	8	7	15	1745	219	15	4	.	.	5	2	0	.	.	.
315	0	0	1	6	28	10	7	236	131	40	172	9	6	17	552	116	4	3	.	.	8	4	0	.	.	.
316	0	0	1	1	31	9	3	243	167	59	148	8	4	19	256	148	18	4	.	.	2	1	0	.	.	.
317	0	0	0	0	21	9	4	208	114	39	147	8	4	12	145	93	29	4	.	.	.	.	0	.	.	.
318	0	0	5	20	26	9	5	172	65	43	115	8	3	16	407	107	18	4	.	.	7	3	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
319	678380d	51	2	1	2	1	7	1	3	29	0	0	0	0	0	1	0	1	.	0	2	0	0	4	0
320	678322d	39	2	1	3	2	6	1	3	5	0	0	0	1	0	0	0	6	.	100	2	1	7.5	4	0
321	677802d	62	3	1	3	1	1	2	3	12	1	0	0	0	0	1	0	2	.	0	1	0.5	3.25	1	0.5
322	747182d	73	11	1	3	5	1	1	3	10	1	0	1	1	0	0	0	0	.	200	2	0	0	4	0
323	754275d	56	3	1	5	7	1	2	3	8	1	0	1	1	0	0	0	0	.	200	2	1	7.5	4	0
324	755617d	47	3	1	3	7	4	2	3	27	1	0	1	1	0	0	0	0	.	100	2	0	0	4	0
325	722650d	46	6	1	5	5	6	2	3	10	0	0	0	0	0	0	0	1.5	.	200	2	2	15	4	0
326	720321d	39	10	1	5	4	1	1	3	10	0	0	0	0	0	1	1	2.5	.	200	2	0	0	4	0
327	719138d	32	6	1	5	5	3	4	3	13	0	0	0	0	0	0	0	3	.	200	2	0	0	4	0
328	682830d	51	2	2	1	7	1	6	3	13	0	0	0	0	0	0	0	1	60	250	2	1	15	4	0
329	682270d	60	13	2	2	1	2	1	3	14	1	0	0	1	0	0	0	0	120	250	2	0	0	4	0
330	679645d	69	2	1	5	6	6	1	3	15	0	0	0	0	0	0	0	1	.	200	2	0	0	4	0
331	683335d	30	3	2	5	1	6	1	3	6	1	0	1	1	0	0	0	0	.	0	1	0	0	1	0.3
332	685214d	51	3	1	3	6	1	2	3	26	1	0	0	0	0	0	0	5.5	.	0	1	1.5	1	4	0
333	714991d	31	8	1	6	4	3	1	3	8	0	0	0	1	0	1	1	0	.	0	2	0	0	4	0
334	714060d	50	11	1	3	4	12	2	3	23	0	0	0	0	0	0	0	2	.	300	2	0	0	4	0
335	725145d	41	2	2	3	1	2	1	3	5	1	0	1	0	0	0	0	0	0	200	2	0.5	10.8	4	0
336	722043d	22	2	2	3	1	3	1	3	8	1	0	0	0	0	0	0	1	0	299	2	0	0	4	0
337	718078d	59	5	1	5	1	3	2	3	6	0	0	0	1	0	0	1	0	.	250	2	0	0	4	0
338	762158d	39	2	2	3	1	2	6	3	17	0	0	0	0	0	0	0	0	0	200	2	0	0	4	0
339	761300d	61	2	1	3	1	0	1	3	13	0	0	1	1	0	0	0	0	.	200	2	0	0	4	0
340	763878d	32	11	1	6	7	1	1	3	4	0	0	0	1	0	0	0	1	.	200	2	1	7.5	4	0
341	666875d	46	3	1	2	1	1	1	3	7	0	0	0	0	0	0	0	1	.	0	2	0.3	7.5	1	0.3
342	663818d	48	2	1	3	6	2	2	3	19	0	0	1	0	0	0	0	0.5	.	250	1	0	0	4	0
343	671723d	34	1	2	6	1	0	1	3	6	0	0	0	0	0	0	0	1	0	200	2	0	0	1	0.5
344	667069d	53	2	1	3	6	12	2	3	23	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
345	671509d	42	2	1	2	3	1	5	3	4	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
346	670273d	55	3	1	1	1	0	1	3	7	0	0	0	0	0	0	0	0	.	250	1	0	0	1	1
347	309578b	21	18	1	5	1	1	1	1	3	0	0	0	0	0	0	0	2	.	100	2	0	0	2	0.5
348	670144d	41	10	2	6	4	3	1	3	4	0	0	1	0	0	0	0	0	0	200	1	0	0	3	0.5
349	670267d	67	8	1	5	4	0	2	3	28	0	0	0	0	0	1	1	1.5	.	0	2	1.5	10.3	4	0
350	709871d	65	6	1	4	1	12	1	3	26	1	0	0	0	0	0	0	1.5	.	500	2	0	0	4	0
351	715195d	75	3	2	1	1	3	1	3	10	1	0	1	0	0	0	0	0.5	240	0	1	0	0	4	0
352	715903d	35	9	2	2	1	1	1	3	3	1	0	0	0	0	0	0	1	0	0	2	1	3.25	4	0
353	715769d	35	2	1	5	4	1	1	3	10	1	0	0	0	0	0	0	2	.	200	2	0.5	7.5	4	0
354	709739d	57	2	1	4	7	0	2	3	30	0	0	0	0	0	0	0	1.5	.	200	1	0	0	4	0
355	713707d	38	2	2	3	1	0	2	3	30	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
356	714707d	52	2	1	3	4	0	2	3	8	0	0	0	0	0	0	1	0.5	.	0	2	1	15	4	0
357	709742d	27	1	1	3	6	2	1	3	4	0	0	0	0	0	0	0	0.5	.	200	2	0	0	4	0
358	705739d	50	3	1	5	3	48	7	3	8	0	0	0	0	0	0	0	3	.	200	2	0	0	4	0
359	714254d	48	3	1	6	4	6	1	3	12	0	0	0	0	0	0	0	0.5	.	250	2	2	15	3	2
360	713130d	49	13	2	5	1	1	1	3	5	0	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
361	837410c	54	1	2	2	1	12	6	3	17	1	0	0	0	0	0	0	0.5	0	200	2	0	0	4	0
362	711546d	63	2	1	5	1	6	2	3	8	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
363	707559d	59	2	1	3	4	48	1	3	12	0	0	1	0	0	0	0	0.5	.	0	1	0	0	4	0
364	709982d	40	6	1	5	6	2	2	3	9	0	0	0	1	0	0	1	10	.	250	2	0	0	4	0
365	707678d	62	3	1	3	3	1	2	3	6	0	0	0	0	0	0	0	4	.	250	1	0	0	4	0
366	704563d	57	3	1	3	6	3	1	3	5	0	0	0	0	0	0	1	0.5	.	250	2	1	7.5	1	1
367	710684d	34	2	1	1	2	2	1	3	3	1	0	1	1	0	0	0	12	.	0	1	0	0	4	0
368	702979d	23	2	2	3	1	2	1	3	4	0	0	0	1	0	0	0	3	0	0	2	0	0	4	0
369	699199d	72	2	1	4	1	2	1	3	26	0	0	0	0	0	0	0	1	.	200	2	0	0	1	1
370	697201d	65	6	1	4	6	3	2	3	28	1	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
371	6.90d	26	2	1	5	1	1	1	3	9	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
319	0	0	8	0	20	12	3	152	72	63	74	8	4	24	63	82	39	5	.	.	5	2	0	.	.	.
320	500	0	1	0	20	6	12	149	134	36	80	5	8	13	470	125	29	4	.	.	5	2	0	.	.	.
321	1500	0.5	2	2	23	10	5	98	163	34	38	8	5	22	85	102	4	4	.	.	.	.	0	.	.	.
322	0	0	8	0	21	11	6	.	.	.	.	9	5	25	126	76	31	4	0.691	-1.8	7	3	2	.	.	.
323	500	1	3	13	20	10	8	.	.	.	.	8	4	25	459	84	10	4	0.689	-1.8	4	3	0	.	.	.
324	0	0	1	15	23		3	109	71	54	34	9	4	18	0.9	.	.	3	0.749	-1.3	6	3	0	.	.	.
325	0	0	2	8	26	9	7	127	68	38	71	8	5	23	0.9	.	.	3	.	.	7	2	0	.	.	.
326	0	0	2	0	24	12	7	97	118	24	53	8	5	17	77	71	14	5	.	.	6	3	0	.	.	.
327	0	0	2	0	22	8	5	96	107	33	45	8	5	20	320	71	13	4	.	.	2	1	0	.	.	.
328	1000	1	0	0	19	8	4	98	50	35	49	7	4	10	782	348	22	4	.	.	5	2	0	.	.	.
329	0	0	0	0	19	7	4	.	.	.	.	9	4	18	264	84	19	4	.	.	.	.	0	.	.	.
330	0	0	20	20	20	9	4	147	75	43	94	8	4	18	110	100	17	4	.	.	6	2	1	4	6	8
331	1000	0.3	0	0	22	7	8	121	167	40	67	5	5	17	859	312	23	4	.	.	5	2	0	.	.	.
332	1000	1	0	17	18	12	3	158	163	30	102	8	3	22	322	207	.	4	.	.	4	2	2	.	.	.
333	0	0	0	0	20	10	9	119	128	29	69	7	3	18	0.9	.	.	4	0.887	-1.9	.	.	2	.	.	.
334	0	0	12	15	25	14	3	216	370	32	127	10	5	19	60	77	16	4	.	.	5	2	0	.	.	.
335	1000	0.5	2	0	25	8	10	183	155	37	116	8	5	12	226	80	17	4	.	.	6	3	0	.	.	.
336	0	0	0	0	18	9	7	170	144	50	95	9	5	17	442	75	22	3	.	.	.	.	0	.	.	.
337	0	0	0	18	18	8	9	169	144	23	121	9	6	10	0.9	.	.	4	.	.	.	.	2	.	.	.
338	0	0	0	0	17	9	4	.	.	.	.	8	4	15	1150	192	15	4	0.517	-3	5	3	0	.	.	.
339	0	0	7	0	20	7	5	87	47	40	39	8	5	17	0.9	.	.	5	.	.	.	.	2	.	.	.
340	0	0	0	0	22	7	16	.	.	.	.	6	7	12	663	55	16	4	0.849	-0.6	6	3	0	.	.	.
341	1000	0.3	0	0	29	8	7	152	68	42	95	8	6	19	247	.	18	3	.	.	.	.	0	.	.	.
342	0	0	1	12	20	9	4	95	90	27	57	8	4	15	184	93	20	4	.	.	4	2	0	.	.	.
343	500	0.5	2	0	42	9	8	133	130	37	74	8	8	19	228	73	12	4	.	.	2	2	0	.	.	.
344	0	0	3	22	25	11	3	227	156	42	155	8	4	22	187	.	14	4	.	.	.	.	2	.	.	.
345	0	0	0	0	22	10	15	105	129	28	54	7	11	16	0.9	.	.	4	.	.	.	.	2	.	.	.
346	1000	1	2	0	23	6	9	89	66	31	48	8	5	19	0.9	.	.	4	.	.	.	.	2	.	.	.
347	0	0	1	0	23	8	19	89	30	30	53	4	8	9	562	70	19	4	0.941	-1.4	5	2	0	.	.	.
348	0	0	15	0	30	8	11	135	73	36	77	10	6	15	0.9	.	.	4	.	.	.	.	2	.	.	.
349	0	0	15	15	25	13	3	104	79	36	56	8	4	22	78	54	24	4	.	.	.	.	1	3	5	6
350	0	0	1	0	25	11	3	124	46	48	71	8	3	19	148	75	27	5	.	.	5	2	0	.	.	.
351	0	0	4	0	20	9	5	207	112	50	137	9	5	29	294	98	15	4	.	.	5	2	0	.	.	.
352	500	1	0	0	21	8	15	98	166	18	53	8	8	14	233	105	15	4	.	.	.	.	0	.	.	.
353	1000	0.5	1	0	24	12	7	123	45	29	69	6	5	19	652	204	8	5	.	.	.	.	0	.	.	.
354	0	0	8	2	24	12	2	190	180	32	123	9	4	20	105	81	26	5	.	.	.	.	0	.	.	.
355	0	0	2	12	21	7	2	162	111	51	89	9	4	20	117	92	17	4	.	.	.	.	0	.	.	.
356	1000	1	12	12	24	10	7	184	117	48	112	8	5	20	410	95	25	4	.	.	5	2	0	.	.	.
357	0	0	0	0	29	7	14	.	.	.	.	8	7	.	0.9	.	.	4	.	.	.	.	2	.	.	.
358	0	0	0	0	21	10	7	.	.	.	.	7	5	17	637	154	18	4	.	.	5	2	0	.	.	.
359	1000	2	1	0	18	9	5	107	63	33	59	8	5	13	168	62	24	4	.	.	6	3	0	.	.	.
360	0	0	10	0	28	7	9	93	61	37	46	8	6	13	762	102	12	4	.	.	7	2	0	.	.	.
361	0	0	4	0	23	10	3	150	135	30	97	8	4	19	162	56	20	4	.	.	.	.	2	.	.	.
362	0	0	15	15	19	8	7	206	108	63	116	9	5	14	0.9	.	.	3	.	.	.	.	2	.	.	.
363	0	0	0	10	22	11	5	163	146	36	93	9	3	19	238	99	18	4	.	.	8	3	2	.	.	.
364	0	0	0	5	17	8	7	138	167	33	76	8	4	13	281	109	17	5	.	.	10	4	0	.	.	.
365	0	0	0	5	18	7	9	110	90	36	55	5	9	11	691	93	11	4	.	.	12	4	0	.	.	.
366	1000	1	1	0	22	8	11	74	68	31	31	6	6	11	0.9	.	.	5	.	.	.	.	2	.	.	.
367	0	0	0	0	22	6	19	150	121	36	73	8	11	10	0.9	.	.	4	.	.	.	.	2	.	.	.
368	0	0	0	0	20	8	12	97	62	36	46	9	10	14	0.9	.	.	4	.	.	.	.	2	.	.	.
369	1000	1	2	0	20		3	.	.	.	.	8	3	19	177	140	17	5	.	.	.	.	0	.	.	.
370	0	0	29	14	25	9	4	161	150	35	96	8	5	20	505	.	15	4	.	.	.	.	2	.	.	.
371	0	0	0	0	21	11	8	114	62	25	82	9	6	21	132	75	18	5	.	.	.	.	2	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
372	662540d	24	2	1	4	1	2	1	3	11	0	0	0	0	0	0	0	0.5	.	0	2	0	0	1	2
373	659318d	50	18	1	6	4	24	2	3	7	1	0	0	0	0	1	1	12	.	200	2	0	0	4	0
374	659670d	41	2	1	2	2	24	1	3	9	1	0	0	0	0	1	0	4	.	200	2	0	0	4	0
375	660370d	24	3	1	2	1	2	1	3	8	1	0	0	0	0	0	0	6	.	0	2	0	0	4	0
376	665631d	17	2	2	3	1	1	1	3	5	1	0	0	1	0	0	0	0	0	0	2	0	0	4	0
377	667189d	56	1	1	3	2	6	1	3	3	1	0	1	1	0	0	0	4	.	200	2	0	0	4	0
378	664643d	31	3	1	3	3	2	1	3	2	0	0	0	1	0	0	0	6	.	0	2	0	0	1	0.6
379	667259d	53	2	1	3	4	1	8	3	19	0	0	0	0	0	1	0	1	.	0	2	0	0	4	0
380	668218d	44	2	1	3	4	12	2	3	4	1	0	1	1	0	0	0	8	.	200	2	2	15	1	2
381	665247d	47	2	1	3	5	12	1	3	5	1	0	0	1	0	0	0	8	.	0	2	1	7.5	4	0
382	668007d	63	6	1	3	1	12	7	3	6	0	0	1	0	0	0	0	0.5	.	500	2	1	15	4	0
383	703851d	36	2	1	5	4	2	1	3	3	1	0	1	0	0	0	0	1.5	.	100	1	0	0	4	0
384	697614d	26	8	1	5	4	2	1	3	9	1	0	1	0	0	0	0	1.5	.	200	2	2	15	4	0
385	698207d	49	9	1	2	3	3	1	1	4	0	0	0	0	0	0	0	3	.	0	2	1	15	4	0
386	696251d	28	2	1	1	7	4	1	3	5	0	0	0	0	0	0	0	1.5	.	200	2	1	7.5	4	0
387	6.76d	56	2	1	4	4	6	7	3	6	0	0	0	0	0	0	0	1	.	250	2	0	0	4	0
388	710801d	46	1	2	3	1	1	1	3	14	0	0	0	0	0	0	0	1	0	200	2	0	0	4	0
389	705697d	52	2	1	1	3	2	6	3	13	0	0	0	0	0	0	0	8	.	0	2	0	0	4	0
390	706358d	53	2	1	3	4	1	2	3	24	0	0	0	0	0	0	0	0.5	.	500	2	0	0	4	0
391	707838d	28	8	2	5	4	2	1	3	3	0	0	0	0	0	0	0	1.5	0	100	2	0	0	4	0
392	692376d	67	1	2	5	1	1	5	3	26	0	0	0	0	0	0	0	0.5	0	200	2	0	0	4	0
393	700699d	80	1	2	2	1	1	1	3	14	1	0	0	0	0	0	0	0.5	210	100	2	0	0	4	0
394	698550d	54	2	1	6	4	1	2	3	13	0	0	0	0	0	1	0	1.5	.	200	2	1	15	4	0
395	6.87d	28	6	1	2	1	1	4	3	4	0	0	0	0	0	0	0	1	.	0	1	1	15	4	0
396	715495d	33	2	2	3	1	6	1	3	1	1	0	0	0	0	0	0	1	.	200	2	0	0	4	0
397	707590d	58	6	1	5	6	3	1	3	9	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
398	713351d	46	2	2	3	1	48	1	3	14	0	0	0	0	0	0	0	1	0	0	1	2	30	4	0
399	672911d	72	11	1	3	1	0	2	3	28	0	0	0	0	0	1	0	1.5	.	500	2	0	0	4	0
400	684604d	46	3	2	3	1	12	1	3	11	0	0	0	0	0	0	0	1	24	200	2	0.5	7.5	4	0
401	672596d	46	6	2	6	1	2	1	3	9	0	0	0	0	0	0	0	0.5	0	150	2	0	0	3	1
402	684779d	30	3	2	3	1	24	1	3	13	1	0	0	0	0	0	0	0.5	0	250	2	0	0	4	0
403	685007d	67	1	1	6	1	6	2	3	18	0	0	1	0	0	0	0	0.5	.	100	1	0	0	4	0
404	690061d	56	2	2	2	1	24	6	3	12	1	0	1	0	0	0	0	0.5	60	0	2	0	0	4	0
405	689552d	45	2	2	2	1	1	1	3	7	1	0	0	0	0	0	0	0.5	0	250	2	0	0	4	0
406	691682d	51	3	2	2	1	1	7	1	9	0	0	0	0	0	0	0	1	48	200	2	0.3	1.75	1	0.3
407	691172d	43	3	2	2	1	1	1	3	9	1	0	0	0	0	0	0	1	0	200	2	0	0	4	0
408	843441a	34	1	2	3	1	1	2	3	12	0	0	0	0	0	0	0	1.5	0	200	2	0	0	4	0
409	691123d	36	1	1	3	1	12	2	3	15	0	0	0	0	0	0	0	1	.	0	1	0	0	4	0
410	690186d	62	2	1	5	1	6	1	3	26	0	0	0	0	0	0	0	1	.	0	2	0	0	1	0.5
411	689713d	54	2	2	3	1	1	2	3	19	1	0	1	0	0	0	0	1	4	250	2	0	0	4	0
412	688797d	46	9	1	3	3	1	1	3	15	0	0	0	0	0	1	0	8	.	0	2	0	0	4	0
413	690023d	38	2	1	3	1	2	1	3	4	1	0	1	1	0	0	0	0.5	0	0	2	1	15	4	0
414	690641d	20	2	1	2	2	3	1	3	5	0	0	0	0	0	1	1	9	.	0	1	0	0	1	2
415	690992d	68	2	1	5	6	0	1	3	23	0	0	0	0	0	0	0	1	.	300	2	0	0	1	2
416	682810d	48	3	2	2	1	1	4	3	26	0	0	0	0	0	0	0	0.5	24	100	1	0	0	4	0
417	689218d	45	1	1	2	2	2	1	3	5	1	0	1	1	0	0	1	4	.	0	2	0	0	4	0
418	682636d	28	15	2	5	4	24	1	3	17	1	0	0	0	0	0	0	0.5	0	0	2	0.3	5	4	0
419	690932d	39	8	1	5	6	24	1	3	4	1	0	0	1	0	1	0	2	.	100	2	0.3	5	4	0
420	689714d	57	3	1	3	2	1	1	3	6	0	0	1	0	0	0	0	0.5	.	0	2	0	0	4	0
421	690520d	66	2	1	1	3	2	1	3	11	0	0	1	0	0	1	0	8	.	100	2	0.3	2.5	1	0.3
422	682368d	71	2	1	5	1	2	1	3	12	0	0	0	0	0	1	0	0.5	.	500	2	0	0	4	0
423	681167d	37	2	1	3	7	60	1	3	9	0	0	0	0	0	1	0	4.5	.	0	2	0	0	1	1
424	680976d	31	3	1	5	5	1	1	3	21	0	0	0	1	0	1	0	8	.	500	2	1	15	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
372	1500	2	1	0	17	10	8	.	.	.	.	.	.	.	180	21	.	.	.	.	.	.	0	.	.	.
373	0	0	3	20	22	8	9	215	105	41	150	8	7	20	179	51	25	4	.	.	7	3	0	.	.	.
374	0	0	2	0	19	11	7	176	95	51	108	8	6	16	258	110	26	4	.	.	.	.	0	.	.	.
375	0	0	0	0	18	10	9	110	124	27	65	8	6	19	336	83	25	5	.	.	4	3	0	.	.	.
376	0	0	0	0	18	6	10	113	101	41	55	8	6	10	605	89	26	3	.	.	7	3	0	.	.	.
377	0	0	5	0	22	8	20	85	79	20	49	7	10	14	434	58	21	4	.	.	5	2	0	.	.	.
378	1000	0.6	0	0	23	5	25	127	112	38	62	8	12	20	576	56	17	4	.	.	7	3	0	.	.	.
379	0	0	10	0	27	13	4	146	227	28	99	8	3	17	231	108	15	4	.	.	3	2	2	.	.	.
380	1000	2	2	10	24	7	13	152	65	59	98	9	5	18	502	103	28	4	.	.	8	3	0	.	.	.
381	0	0	0	0	24	10	12	151	75	24	105	7	5	15	440	99	25	4	.	.	.	.	0	.	.	.
382	1000	1	1	10	21	9	10	179	96	41	106	9	5	18	318	64	30	3	.	.	7	3	0	.	.	.
383	0	0	1	0	22	6	22	131	57	50	63	8	8	9	531	144	25	4	.	.	.	.	2	.	.	.
384	1500	2	2	0	21	10	10	182	223	28	118	9	4	24	53	45	29	5	.	.	.	.	2	.	.	.
385	1000	1	0	0	18	6	15	106	108	34	46	8	6	10	191	78	25	4	.	.	.	.	2	.	.	.
386	1000	1	0	0	24	10	12	116	73	48	62	7	8	19	589	.	26	5	.	.	.	.	2	.	.	.
387	0	0	0	0	20	8	10	.	.	.	.	7	5	10	569	106	.	4	.	.	.	.	2	.	.	.
388	0	0	0	0	25	9	4	188	110	42	124	10	4	27	203	52	4	4	.	.	5	3	0	.	.	.
389	0	0	0	0	18	9	5	.	.	.	.	8	5	16	58	64	33	4	.	.	10	4	1	2	2	3
390	0	0	1	5	27	11	3	166	175	39	96	8	4	21	89	78	16	4	.	.	6	3	0	.	.	.
391	0	0	0	0	19	10	17	186	201	32	101	6	9	10	1012	90	12	5	.	.	.	.	2	.	.	.
392	0	0	5	0	34	11	2	.	.	.	.	9	4	24	0.9	83	19	4	.	.	.	.	2	.	.	.
393	0	0	0	0	19	11	3	191	142	50	107	8	4	26	163	98	30	5	.	.	.	.	2	.	.	.
394	1000	1	5	20	21	11	6	184	124	33	129	8	5	20	344	142	21	5	.	.	.	.	0	.	.	.
395	1000	1	1	0	18	8	18	80	62	24	47	7	10	9	1331	115	28	4	.	.	.	.	2	.	.	.
396	0	0	0	0	17	8	35	.	.	.	.	7	14	10	0.9	51	14	4	.	.	8	3	0	.	.	.
397	0	0	1	0	19	9	7	130	61	52	68	8	4	16	269	100	12	4	.	.	6	2	0	.	.	.
398	1000	2	4	0	20	10	4	124	101	44	63	8	4	16	356	76	28	4	.	.	6	2	0	.	.	.
399	0	0	2	20	22	10	2	131	112	34	74	8	3	.	37	85	20	4	.	.	5	2	1	1	1	1
400	1000	0.5	5	0	19	9	4	187	132	42	116	7	7	19	1158	221	13	5	.	.	9	3	0	.	.	.
401	1000	1	4	0	24	9	5	110	104	33	66	9	5	19	729	99	10	5	.	.	.	.	0	.	.	.
402	0	0	0	0	18	9	4	104	70	43	41	7	3	17	741	227	18	4	.	.	.	.	0	.	.	.
403	0	0	25	23	24	11	4	111	60	34	67	8	3	.	396	97	14	5	.	.	.	.	2	.	.	.
404	0	0	10	10	24	8	4	129	212	28	66	6	4	15	1000	256	15	5	.	.	2	1	0	.	.	.
405	0	0	5	0	22	7	7	183	250	30	114	4	11	12	483	134	4	4	.	.	3	1	0	.	.	.
406	1000	0.3	10	0	19	9	4	176	118	70	80	7	4	22	405	150	24	4	.	.	7	3	0	.	.	.
407	0	0	5	0	36	7	6	102	95	32	55	7	5	15	1016	126	15	4	.	.	3	1	0	.	.	.
408	0	0	1	5	21	8	5	111	124	30	60	9	6	23	248	122	24	4	.	.	6	3	0	.	.	.
409	0	0	1	10	22	6	5	105	39	49	45	9	4	10	78	146	20	2	.	.	.	.	0	.	.	.
410	1000	0.5	12	0	16	7	3	163	117	36	113	9	4	29	96	116	17	4	.	.	8	3	1	4	6	11
411	0	0	1	12	18	9	3	124	170	29	57	9	5	24	15	253	16	3	.	.	4	1	0	.	.	.
412	0	0	1	0	19	7	7	185	149	41	112	8	5	17	507	94	25	4	.	.	10	4	0	.	.	.
413	1000	1	1	0	27	5	13	118	101	18	77	8	8	14	386	56	18	3	.	.	.	.	0	.	.	.
414	500	2	0	0	20	9	7	222	36	47	196	7	10	.	72	21	3	5	.	.	5	2	0	.	.	.
415	500	1	3	0	23	8	3	165	156	27	110	8	4	18	125	115	22	4	.	.	6	3	2	.	.	.
416	0	0	5	0	23	11	3	136	162	34	75	8	5	20	126	118	22	4	.	.	5	2	0	.	.	.
417	0	0	0	0	25	11	12	80	123	21	42	7	6	12	294	173	26	4	.	.	7	2	0	.	.	.
418	1000	0.3	2	0	18	11	4	164	100	52	99	7	3	16	477	111	16	4	.	.	2	2	0	.	.	.
419	1000	0.3	2	0	25	10	16	.	.	.	.	6	8	13	463	.	.	5	.	.	.	.	2	.	.	.
420	0	0	0	0	17	10	10	135	95	36	76	8	6	17	149	71	30	5	.	.	11	4	0	.	.	.
421	1000	0.3	0	0	17	10	6	151	177	34	84	9	5	20	5	72	43	5	.	.	8	3	0	.	.	.
422	0	0	2	5	18	12	5	239	140	140	46	.	.	15	154	.	.	.	.	.	10	3	1	1	1	2
423	1000	1	1	0	18	10	7	134	101	40	65	8	3	16	228	184	28	5	.	.	.	.	0	.	.	.
424	1000	1	0	0	20	11	4	116	131	30	67	8	5	19	151	64	22	4	.	.	.	.	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
425	687156d	30	2	1	3	2	8	1	3	12	0	0	1	0	0	0	0	4	.	0	2	1	15	1	1
426	687024d	28	3	1	3	2	1	1	1	9	1	0	1	1	0	0	1	8	.	100	1	0	0	2	0.5
427	690180d	27	1	2	5	4	2	1	3	7	0	0	0	0	0	0	0	0.5	0	250	1	0.5	1.86	4	0
428	689741d	42	12	1	5	4	1	7	1	6	0	0	0	0	0	0	0	0.5	.	250	2	0	0	4	0
429	690406d	47	3	2	2	1	3	2	3	23	0	0	1	1	0	0	0	7	1	250	2	0	0	4	0
430	678669d	76	6	1	3	1	24	2	3	21	1	0	0	0	0	0	0	0.5	.	500	1	0	0	4	0
431	670184d	37	2	1	5	4	2	1	3	5	0	0	1	0	0	1	0	0.5	.	0	2	0	0	4	0
432	675900d	52	1	1	3	1	12	2	3	11	0	0	0	0	0	1	0	0.5	.	0	2	0	0	4	0
433	676652d	33	7	2	3	1	3	1	3	3	1	0	0	0	0	0	0	1	0	0	1	0	0	3	0.5
434	671203d	32	2	1	3	6	1	4	3	19	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
435	675979d	42	9	2	3	1	1	1	1	9	0	0	0	0	0	0	0	1	0	0	1	0.3	0.75	1	0.3
436	676079d	52	5	1	5	4	1	2	3	28	0	0	0	0	0	0	1	0	.	100	2	0	0	4	0
437	676243d	35	2	2	5	1	3	1	3	7	0	0	1	0	0	0	0	0.5	0	100	2	0	0	1	0.5
438	675270d	56	3	1	3	6	2	2	3	14	0	0	1	1	0	0	0	0.5	.	0	2	0.3	2.5	1	0.3
439	675797d	50	2	1	3	5	1	1	3	11	0	0	0	1	0	0	0	2	.	100	2	0	0	4	0
440	675472d	50	22	2	3	6	12	1	3	2	0	0	0	1	0	0	0	0.5	12	100	1	1	15	1	1
441	672000d	77	2	1	3	1	1	5	3	9	0	0	0	0	0	0	0	0.5	.	0	1	0	0	4	0
442	676781d	28	8	1	4	5	1	1	3	10	1	0	0	0	0	0	0	3	.	0	2	0.5	3.65	4	0
443	677175d	30	1	1	6	5	1	1	3	15	0	0	0	0	0	0	0	3	.	0	2	0	0	4	0
444	676833d	46	8	2	2	1	60	6	3	12	0	0	0	0	0	0	0	1	48	0	2	0	0	4	0
445	672765d	22	3	2	5	4	2	1	3	7	0	0	0	0	0	0	0	1.5	0	0	2	0	0	4	0
446	672746d	41	12	1	3	5	1	1	3	16	0	0	1	0	0	1	0	0.5	.	0	2	1	7.5	4	0
447	670019d	55	5	1	3	7	3	2	3	6	0	0	0	0	0	0	0	1	.	300	2	2.5	22.5	1	2.5
448	672762d	34	2	2	2	1	4	1	1	5	0	0	0	0	0	0	0	0.5	0	0	2	0.5	3.65	1	0.5
449	629300d	50	2	1	2	3	6	2	3	29	0	0	0	1	0	0	0	2.5	.	100	1	0	0	4	0
450	634875d	39	2	1	4	6	1	1	3	22	0	0	1	0	0	1	0	2	.	100	2	0	0	4	0
451	634990d	58	13	1	5	6	6	2	3	14	0	0	1	1	0	0	0	0.5	.	200	1	0	0	4	0
452	633919d	53	11	1	5	4	0	2	3	9	1	0	0	0	0	0	1	0.5	.	100	2	1	3.25	4	0
453	633493d	51	1	1	1	2	6	2	1	6	0	0	1	0	0	0	0	12	.	200	2	0	0	4	0
454	628025d	61	1	1	3	6	1	2	3	7	0	0	1	0	0	0	0	1	.	200	2	0	0	2	0.5
455	634385d	48	10	2	2	1	24	2	1	7	1	0	1	1	0	0	0	1	0	200	2	0	0	4	0
456	634119d	23	2	1	3	7	0	1	1	5	1	0	1	1	0	0	0	1	.	250	2	0	0	4	0
457	638741d	50	8	1	3	6	7	2	3	12	1	0	1	0	0	1	0	3	.	150	2	0	0	4	0
458	637961d	60	2	1	1	6	24	1	3	29	1	0	1	0	0	0	0	4	.	250	2	0	0	4	0
459	637948d	34	2	1	5	7	2	1	3	13	0	0	0	0	0	1	0	5	.	0	2	0	0	4	0
460	961788c	56	3	1	5	1	0	2	3	19	0	0	0	0	0	0	0	1	.	250	2	0.3	0.75	4	0
461	429946d	55	5	1	2	2	3	1	3	21	1	0	1	0	0	0	0	4.5	.	50	2	0	0	4	0
462	636755d	39	1	1	2	2	0	8	3	28	0	0	0	0	0	0	0	10	.	200	2	0	0	4	0
463	636981d	34	3	1	3	3	1	1	3	3	1	0	1	0	0	0	0	10	.	0	1	0	0	1	0.3
464	640464d	48	1	2	3	2	1	1	3	3	1	0	0	0	0	0	0	8	0	50	2	0	0	4	0
465	637978d	48	2	2	3	1	2	1	3	8	1	0	1	1	0	0	0	4	120	0	2	1	7.5	4	0
466	637732d	22	2	2	5	1	5	1	3	6	1	0	0	1	0	0	0	0.5	.	0	2	1	7.5	4	0
467	642103d	32	6	1	5	1	3	1	3	7	0	0	0	0	0	0	0	3	.	250	2	0	0	1	1
468	646705d	50	10	2	6	1	24	1	3	7	0	0	0	0	0	0	0	1	.	100	2	1	15	4	0
469	645904d	51	15	1	6	4	0	2	3	10	0	0	1	0	0	0	0	0.5	.	250	2	0	0	4	0
470	663359d	40	2	1	3	2	0	1	1	6	0	0	0	0	0	0	0	10	.	100	2	0	0	3	0.5
471	664392d	48	3	1	5	4	0	1	3	14	0	0	0	0	0	0	0	0.5	.	50	2	0	0	2	1
472	665701d	33	2	1	3	2	9	1	3	2	1	0	1	1	0	0	0	10	.	200	2	0	0	4	0
473	663778d	54	3	2	1	1	12	2	3	14	1	0	0	1	0	0	0	0.5	48	100	1	0	0	4	0
474	621825d	40	2	2	5	1	12	4	3	19	1	0	0	0	0	0	0	0.5	0	200	2	0	0	4	0
475	623845d	62	3	1	1	1	6	2	3	21	0	0	0	0	0	0	0	0.5	.	200	2	0	0	4	0
476	622333d	55	3	1	3	1	3	2	3	23	0	0	0	0	0	1	1	5	.	200	2	0	0	4	0
477	623509d	28	2	1	2	2	3	1	3	3	0	0	0	0	0	1	1	1.5	.	0	2	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
425	1000	1	1	0	21	10	6	162	69	56	87	9	5	18	110	61	24	4	.	.	6	2	0	.	.	.
426	0	0	0	0	18	9	10	178	172	30	112	7	6	19	1025	109	18	4	.	.	6	1	2	.	.	.
427	0	0	0	0	29	9	8	138	128	32	87	8	8	12	833	80	16	5	.	.	8	3	0	.	.	.
428	0	0	4	15	.	6	10	62	109	20	25	8	7	9	260	150	18	4	.	.	10	4	0	.	.	.
429	0	0	0	15	.	6	2	86	141	27	45	9	4	17	18	95	48	4	.	.	4	2	2	.	.	.
430	0	0	20	20	25	10	3	182	97	59	104	8	4	19	231	177	8	4	.	.	10	3	0	.	.	.
431	0	0	0	0	22	8	13	175	184	29	84	7	12	10	564	46	16	4	.	.	9	4	2	.	.	.
432	0	0	7	20	23	8	6	.	.	.	.	8	4	21	263	98	28	4	.	.	4	1	1	2	4	5
433	0	0	1	0	19	8	16	269	165	29	198	9	10	12	255	86	12	4	.	.	6	2	0	.	.	.
434	0	0	2	0	36	.	4	157	73	49	84	8	4	21	281	55	20	4	.	.	.	.	2	.	.	.
435	1000	0.3	3	0	23	8	7	149	92	47	91	8	4	26	751	84	12	4	.	.	6	2	2	.	.	.
436	0	0	0	10	19	10	3	206	225	26	123	9	3	18	105	174	12	4	.	.	.	.	0	.	.	.
437	1000	0.5	1	0	23	8	7	193	312	41	103	9	4	23	0.9	.	.	3	.	.	.	.	2	.	.	.
438	1000	0.3	1	20	24	8	5	96	92	28	55	7	6	18	471	111	17	4	.	.	5	2	0	.	.	.
439	0	0	17	0	28	9	6	123	132	39	66	8	6	17	387	68	23	4	.	.	4	2	0	.	.	.
440	1000	1	5	0	22	6	19	106	46	40	64	6	10	10	738	139	15	4	.	.	4	2	0	.	.	.
441	0	0	0	0	18	7	6	.	.	.	.	7	3	15	118	47	26	3	.	.	.	.	0	.	.	.
442	1000	0.5	0	0	18	8	7	230	258	31	144	8	4	15	162	53	24	4	.	.	5	2	0	.	.	.
443	0	0	0	0	28	12	5	169	94	32	126	8	4	25	799	50	17	5	.	.	5	2	0	.	.	.
444	0	0	5	0	25	11	4	175	97	47	113	9	5	26	113	64	10	5	.	.	5	2	0	.	.	.
445	0	0	2	0	18	8	6	128	136	32	76	8	6	15	351	76	20	4	.	.	5	2	0	.	.	.
446	1000	1	1	0	20	10	4	158	103	58	88	9	3	22	83	67	24	4	.	.	7	1	0	.	.	.
447	1000	2.5	6	10	29	9	10	214	114	56	129	8	5	18	649	101	7	3	.	.	.	.	0	.	.	.
448	1000	0.5	0	0	21	10	10	192	204	40	131	9	5	26	201	83	29	5	.	.	.	.	0	.	.	.
449	0	0	14	1	21	9	3	313	143	60	210	9	5	21	82	.	10	3	.	.	.	.	0	.	.	.
450	0	0	15	0	18	12	3	141	146	31	77	9	5	23	227	97	26	4	.	.	2	1	0	.	.	.
451	0	0	8	4	27	10	5	125	72	46	56	9	4	17	444	162	11	4	.	.	2	1	0	.	.	.
452	0	0	15	15	26	7	7	122	71	39	62	7	5	22	854	94	17	4	.	.	3	2	0	.	.	.
453	1000	1	15	15	24	10	11	170	144	35	113	8	6	25	403	69	19	4	.	.	3	2	1	2	2	3
454	0	0	20	7	21	7	9	201	78	45	141	8	5	18	512	102	18	3	.	.	4	2	0	.	.	.
455	0	0	14	10	25	8	8	201	177	40	119	8	5	26	834	.	6	3	.	.	2	2	0	.	.	.
456	0	0	0	0	18	7	13	174	203	23	97	6	4	14	935	184	24	3	.	.	1	1	0	.	.	.
457	0	0	4	18	22	11	6	358	232	29	268	8	5	23	878	152	13	4	.	.	5	3	0	.	.	.
458	0	0	0	24	24	10	2	131	253	25	63	8	4	23	326	71	12	4	.	.	.	.	0	.	.	.
459	0	0	0	0	.	13	6	187	272	29	110	9	4	22	324	137	56	5	.	.	2	1	0	.	.	.
460	0	0	20	2	22	10	4	169	150	42	99	6	5	25	385	120	8	4	.	.	3	2	0	.	.	.
461	0	0	2	0	19	7	3	117	133	27	67	8	4	17	45	67	33	4	.	.	.	.	0	.	.	.
462	0	0	2	0	22	12	3	146	76	45	82	8	5	19	175	71	27	4	.	.	5	2	0	.	.	.
463	1000	0.3	2	0	19	9	21	150	110	47	79	8	14	12	317	87	20	3	.	.	2	2	2	.	.	.
464	0	0	0	0	24	9	16	183	228	21	116	8	8	19	0.9	.	.	4	.	.	.	.	0	.	.	.
465	0	0	2	0	23	6	7	112	32	36	67	9	5	20	509	93	22	3	.	.	1	1	0	.	.	.
466	1000	1	0	0	14	7	7	156	84	68	67	8	5	12	0.9	.	.	4	.	.	.	.	0	.	.	.
467	1000	1	10	0	19	8	8	148	68	51	83	8	6	15	402	59	19	4	.	.	5	2	0	.	.	.
468	1000	1	8	18	27	10	7	226	79	67	141	9	4	21	359	78	18	3	.	.	.	.	0	.	.	.
469	0	0	6	6	25	8	6	171	176	29	117	6	5	15	171	86	21	4	0.94	-1.2	.	.	2	.	.	.
470	0	0	0	0	23	8	10	120	49	41	69	8	7	14	146	46	21	4	.	.	.	.	0	.	.	.
471	0	0	5	0	23	10	5	111	92	32	57	8	5	12	250	114	25	4	.	.	3	2	0	.	.	.
472	0	0	1	0	21	5	25	104	106	30	54	9	9	14	212	52	26	4	.	.	10	4	0	.	.	.
473	0	0	2	20	24	9	4	201	185	50	108	9	4	19	181	139	15	4	.	.	5	3	0	.	.	.
474	0	0	1	0	25	10	3	223	151	35	133	7	4	21	504	87	4	3	.	.	4	2	0	.	.	.
475	0	0	5	10	25	9	3	204	123	76	94	9	6	29	107	84	11	2	.	.	3	2	0	.	.	.
476	0	0	3	7	22	8	3	164	95	39	87	8	5	15	204	188	28	4	.	.	6	3	0	.	.	.
477	0	0	1	0	23	5	18	128	136	20	78	6	11	7	0.9	.	.	4	.	.	.	.	2	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
478	623948d	49	2	1	3	4	0	1	3	6	0	0	0	0	0	0	0	1.5	.	0	2	0	0	1	1
479	623760d	38	3	1	5	6	1	1	3	5	0	0	0	0	0	1	0	1.5	.	100	2	0	0	4	0
480	614080d	69	1	1	3	2	1	1	3	7	0	0	0	0	0	1	0	1	.	0	2	0	0	4	0
481	624328d	31	8	1	3	5	1	1	3	5	1	0	0	0	0	0	0	1.5	.	500	2	1	7.5	4	0
482	627810d	60	2	1	3	1	36	2	3	7	0	0	0	0	0	0	0	1.5	.	0	2	0	0	4	0
483	624583d	56	2	1	4	5	1	2	3	27	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
484	620179d	50	1	1	3	6	0	1	3	23	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
485	624568d	56	3	1	4	2	1	2	3	16	0	0	0	0	0	0	0	5	.	200	2	0.5	7.5	4	0
486	624796d	43	8	1	5	5	1	1	3	6	0	0	0	0	0	1	0	3	.	200	2	1	7.5	4	0
487	581405d	55	21	1	3	7	3	2	3	17	1	0	0	0	0	1	1	3	.	200	2	0	0	4	0
488	623396d	60	3	1	5	5	1	2	3	11	0	0	0	0	0	0	0	1.5	.	0	2	0.3	1.75	3	0.3
489	627049d	57	13	1	3	4	1	8	1	5	0	0	0	0	0	0	0	1.5	.	200	2	0.3	2.5	1	0.3
490	627621d	65	1	1	3	1	1	1	3	6	1	0	0	0	0	1	0	0.5	.	200	2	0	0	4	0
491	626083d	59	3	1	3	4	3	2	1	8	0	0	0	0	0	1	0	1	.	200	2	1	7.5	1	1
492	624794d	48	2	1	3	3	3	2	3	10	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
493	626354d	26	2	1	3	7	2	1	1	6	0	0	0	0	0	0	0	3	.	100	2	0.5	7.5	4	0
494	623621d	54	1	2	1	1	1	1	3	6	0	0	0	0	0	0	0	1.5	180	200	2	0	0	4	0
495	628456d	55	3	1	4	4	1	7	1	6	0	0	0	0	0	0	0	1.5	.	200	1	0.3	1.75	1	0.3
496	633688d	54	3	2	1	1	1	2	3	17	1	0	0	0	0	0	0	2	.	500	2	0.6	10	4	0
497	631774d	32	8	1	4	5	12	1	3	12	1	0	1	1	0	0	0	12	.	100	2	2	7.5	4	0
498	631236d	53	6	1	4	6	1	2	3	21	0	0	0	0	0	0	1	2	.	250	2	0	0	4	0
499	629240d	30	3	1	4	1	1	1	3	7	1	0	0	0	0	0	0	1.5	.	100	2	1	7.5	2	1
500	633145d	28	2	1	2	2	2	1	3	6	0	0	1	0	0	0	0	2	.	100	2	1	3.25	4	0
501	653410d	65	1	1	2	1	24	1	3	6	1	0	0	0	0	1	0	1	.	500	2	0	0	4	0
502	648010d	65	1	1	2	3	12	2	3	22	0	0	0	1	0	0	0	8	.	250	2	0	0	4	0
503	629654d	59	2	1	3	1	1	1	3	23	1	0	0	0	0	0	0	5.5	.	100	1	0	0	4	0
504	620464d	60	1	1	6	5	24	2	3	17	1	0	1	0	0	0	0	0	.	150	2	0	0	4	0
505	634185d	58	2	1	3	2	2	1	3	12	1	0	0	1	0	1	0	12	.	100	2	1	15	4	0
506	634330d	59	2	1	5	1	4	2	3	7	0	0	0	1	0	1	0	2	.	250	1	0	0	1	1
507	631286d	23	2	1	5	4	1	1	3	20	1	0	0	0	0	0	0	2	.	100	2	0	0	1	1
508	633228d	48	2	2	1	1	1	1	3	7	0	0	0	1	0	0	0	1	180	0	2	1.5	22.5	4	0
509	633833d	24	2	1	3	1	2	1	1	6	0	0	1	0	0	0	0	8	.	100	2	1	3.75	1	1
510	635189d	64	3	1	3	1	6	2	3	12	1	0	0	1	0	0	0	1	.	50	2	1	7.5	4	0
511	634046d	51	2	1	3	3	0	2	3	9	0	0	0	0	0	0	0	10	.	200	2	0	0	4	0
512	635790d	25	2	1	2	2	1	1	3	5	0	0	0	0	0	0	0	8	.	50	1	0	0	3	0.5
513	636189d	67	11	1	5	1	1	1	3	10	0	0	0	1	0	0	0	2	.	0	1	0	0	1	1
514	634514d	32	3	1	5	4	1	1	3	10	0	0	0	1	0	0	0	10	.	200	1	0	0	4	0
515	637009d	34	2	1	2	7	2	1	3	6	1	0	1	1	0	0	0	0	.	100	1	0	0	4	0
516	636961d	52	1	1	2	2	2	8	3	15	0	0	0	0	0	0	0	8	.	200	2	0	0	4	0
517	631250d	60	1	1	1	3	0	1	3	26	1	0	0	1	0	0	0	8	.	500	1	0	0	4	0
518	633025d	64	1	1	1	2	6	1	3	15	0	0	0	1	0	0	0	12	.	50	2	0	0	4	0
519	621590d	50	2	1	3	4	3	1	3	21	0	0	0	0	0	1	1	5	.	0	2	0	0	4	0
520	623432d	22	2	1	6	5	1	1	1	6	0	0	0	0	0	1	0	1.5	.	0	2	0.3	3	1	0.3
521	621837d	16	3	1	4	1	1	4	3	15	0	0	0	0	0	0	0	1.5	.	100	2	0	0	4	0
522	654987d	44	2	1	2	6	0	1	3	6	0	0	0	0	0	0	0	4	.	0	2	0	0	4	0
523	657799d	41	2	1	3	2	1	2	3	7	1	0	1	1	0	0	0	6	.	250	2	0	0	4	0
524	658244d	55	2	1	3	4	1	1	3	3	1	0	0	0	0	0	0	7	.	0	2	0.5	7.5	4	0
525	657934d	30	3	1	5	4	1	1	1	5	1	0	1	0	0	0	0	2.5	.	200	2	0.5	7.5	4	0
526	657882d	45	3	1	1	6	6	1	3	7	0	0	0	1	0	0	0	3.5	.	250	2	0	0	4	0
527	176739c	58	1	2	2	1	0	2	3	17	0	0	0	0	0	0	0	1	84	0	2	0	0	4	0
528	623831d	22	3	1	2	3	3	1	1	7	0	0	0	0	0	0	0	1.5	.	200	2	0.5	3.75	1	0.5
529	657526d	51	8	1	3	1	6	2	3	14	1	0	0	1	0	0	0	0.5	.	0	2	2	15	4	0
530	648112d	76	5	1	4	1	4	1	3	26	0	0	1	0	0	0	0	0.5	.	100	2	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
478	1000	1	2	17	22	7	10	148	112	23	99	9	5	22	234	81	13	4	.	.	3	1	2	.	.	.
479	500	1	0	0	22	8	13	104	59	33	50	8	7	20	0.9	.	.	3	.	.	.	.	2	.	.	.
480	0	0	0	0	16	8	8	194	224	40	112	8	8	14	622	98	12	3	.	.	.	.	0	.	.	.
481	1000	1	6	0	25	10	12	110	144	25	58	9	8	18	180	60	20	4	.	.	3	1	0	.	.	.
482	0	0	3	20	22	7	8	76	76	29	20	8	6	15	0.9	119	.	4	.	.	1	0	0	.	.	.
483	0	0	5	5	24	11	3	286	131	68	175	9	4	23	331	126	6	3	.	.	2	1	0	.	.	.
484	0	0	2	0	21	10	3	168	139	34	85	8	4	21	59	70	24	4	.	.	7	3	0	.	.	.
485	1000	0.5	0	7	21	8	6	117	180	20	58	9	5	15	38	93	14	4	.	.	3	1	0	.	.	.
486	1500	1	2	0	26	9	11	142	59	34	90	9	6	18	212	47	18	4	.	.	5	3	0	.	.	.
487	0	0	0	2	21	9	4	138	164	26	72	9	4	19	70	.	36	4	.	.	2	1	0	.	.	.
488	0	0	3	3	22	8	6	159	62	33	109	5	7	20	276	83	7	3	.	.	.	.	0	.	.	.
489	1500	0.3	0	0	23	10	11	129	95	55	41	9	6	25	194	73	.	5	.	.	.	.	2	.	.	.
490	0	0	0	0	25	11	9	225	166	25	154	7	5	18	748	410	12	4	.	.	.	.	2	.	.	.
491	1000	1	3	6	21	10	7	145	112	44	71	8	5	18	0.9	.	.	3	.	.	.	.	2	.	.	.
492	0	0	2	4	24	9	7	188	218	38	98	8	6	22	83	83	17	3	.	.	1	0	0	.	.	.
493	0	0	0	0	21	6	11	108	94	25	58	7	9	14	0.9	.	.	3	.	.	.	.	2	.	.	.
494	0	0	6	0	21	6	7	264	143	36	184	8	5	13	596	130	15	4	.	.	3	2	0	.	.	.
495	1500	0.3	2	7	23	12	10	165	178	29	94	5	6	20	869	162	10	4	.	.	9	4	0	.	.	.
496	1000	0.6	5	10	21	13	4	152	85	91	34	8	4	25	1071	83	17	4	.	.	3	1	0	.	.	.
497	0	0	10	0	26	10	6	270	349	37	167	9	7	21	0.9	.	.	4	.	.	.	.	2	.	.	.
498	0	0	0	10	22	8	3	127	130	40	64	8	4	20	173	88	18	4	.	.	1	0	0	.	.	.
499	0	0	0	0	15	10	10	193	292	27	116	4	14	14	1241	335	18	4	.	.	4	2	0	.	.	.
500	0	0	0	0	28	8	11	222	186	34	139	9	7	17	0.9	.	.	4	.	.	.	.	2	.	.	.
501	0	0	0	12	25	13	10	.	.	.	.	10	6	9	7	178	.	3	.	.	.	.	0	.	.	.
502	0	0	2	6	18	11	3	.	.	.	.	8	4	25	0.9	.	.	4	.	.	6	3	0	.	.	.
503	0	0	5	0	22	10	3	100	161	27	47	8	3	28	170	76	24	3	.	.	2	2	0	.	.	.
504	0	0	20	20	23	15	4	110	229	23	53	8	3	28	120	112	12	5	.	.	.	.	0	.	.	.
505	1000	1	2	0	17	7	5	114	21	51	52	8	6	17	487	178	34	4	.	.	.	.	0	.	.	.
506	1000	1	13	8	22	9	8	136	103	30	77	8	6	24	351	68	14	4	.	.	.	.	0	.	.	.
507	500	1	1	0	17	12	5	175	97	64	87	8	5	17	130	84	17	5	.	.	2	1	2	.	.	.
508	1000	1.5	0	0	19	4	7	151	104	53	84	7	6	14	886	126	22	5	.	.	1	1	0	.	.	.
509	1000	1	0	0	19	10	12	125	113	48	49	9	8	20	157	96	4	4	0.764	-2.8	2	2	0	.	.	.
510	500	1	2	1	24	7	5	144	167	33	86	6	5	15	376	171	22	4	.	.	1	1	0	.	.	.
511	0	0	3	12	21	6	7	140	86	51	65	9	7	16	0.9	.	.	4	.	.	.	.	2	.	.	.
512	0	0	2	0	19	5	14	96	59	32	50	7	8	15	488	99	23	4	.	.	2	2	0	.	.	.
513	1000	1	20	0	28	9	6	92	95	37	34	8	4	18	439	88	22	4	.	.	.	.	0	.	.	.
514	0	0	0	0	33	12	7	189	269	34	106	7	5	17	1312	107	13	4	.	.	0	0	0	.	.	.
515	0	0	2	0	23	7	10	184	71	63	106	8	8	12	886	140	26	3	.	.	.	.	2	.	.	.
516	0	0	15	15	34	13	5	553	275	43	427	9	5	19	221	60	19	2	.	.	2	1	0	.	.	.
517	0	0	0	0	22	13	3	147	82	38	87	.	.	25	0.9	.	.	.	.	.	1	1	0	.	.	.
518	0	0	5	0	20	11	4	.	.	.	.	8	4	15	227	108	48	4	.	.	3	1	0	.	.	.
519	0	0	6	0	25	11	3	136	112	22	88	8	3	24	205	138	25	4	.	.	1	1	0	.	.	.
520	1500	0.3	0	0	19	10	11	242	276	35	145	9	4	22	358	217	8	4	.	.	4	2	0	.	.	.
521	0	0	0	0	15	7	6	153	227	24	88	9	9	19	1164	87	12	4	.	.	4	3	0	.	.	.
522	0	0	2	0	23	8	10	159	163	25	102	7	11	.	711	70	25	4	.	.	.	.	2	.	.	.
523	0	0	2	2	21	6	9	92	95	35	43	9	8	16	138	67	15	3	.	.	.	.	2	.	.	.
524	1000	0.5	0	0	22	8	18	.	.	.	.	8	10	10	0.9	59	.	4	.	.	.	.	2	.	.	.
525	1000	0.5	0	0	22	8	12	222	210	34	149	9	8	23	350	65	11	3	.	.	.	.	0	.	.	.
526	0	0	0	0	23	9	8	132	81	39	79	8	6	14	398	159	22	4	.	.	.	.	0	.	.	.
527	0	0	5	10	29	9	3	151	135	18	102	9	3	24	180	135	27	4	.	.	4	2	1	4	7	10
528	1000	0	0	0	.	8	10	165	350	33	68	9	6	23	36	98	7	3	.	.	2	2	0	.	.	.
529	1500	2	1	21	21	10	5	141	561	18	52	9	4	23	48	74	22	4	.	.	7	3	0	.	.	.
530	0	0	3	20	23	11	3	114	100	26	69	9	3	23	123	63	20	4	.	.	5	2	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
531	656867d	55	13	1	5	6	3	2	1	6	0	0	1	0	0	0	0	0.5	.	150	2	0	0	4	0
532	659061d	40	2	1	3	4	24	4	3	26	0	0	1	0	0	0	0	0.5	.	250	2	0	0	4	0
533	659084d	56	2	2	2	1	24	1	3	8	0	0	1	1	0	0	0	8	84	0	2	0	0	4	0
534	653086d	39	3	1	6	6	3	1	3	18	0	0	1	1	0	0	0	0.5	.	1000	1	1	22.5	4	0
535	653079d	48	6	1	5	4	0	1	3	27	0	0	0	0	0	0	0	0.5	.	250	2	0	0	4	0
536	652319d	26	3	1	3	7	1	1	3	4	0	0	0	0	0	0	0	4	.	500	2	0.3	2.5	4	0
537	652168d	45	2	1	3	6	3	1	3	11	0	0	0	0	0	0	0	0	.	200	2	0	0	1	1
538	646801d	67	1	1	3	1	6	2	3	22	1	0	1	0	0	0	0	0.5	.	100	1	0	0	4	0
539	944660b	65	1	1	3	1	36	2	3	22	0	0	1	1	0	0	0	0.5	.	400	2	0	0	4	0
540	648881d	29	5	1	6	5	2	1	3	3	0	0	1	0	0	1	1	0.5	.	200	2	2	15	4	0
541	645134d	66	2	1	5	1	36	1	3	6	1	0	0	1	0	0	0	0.5	.	0	2	1	7.5	1	1
542	644703d	46	3	1	3	7	2	2	3	10	0	0	0	0	0	0	1	1	.	250	1	0	0	4	0
543	644634d	20	2	1	3	1	2	1	1	6	1	0	1	1	0	0	0	1	.	100	1	0	0	4	0
544	645803d	40	2	1	5	4	1	1	3	7	0	0	0	0	0	0	0	1	.	250	2	0	0	4	0
545	642668d	64	3	1	5	1	3	2	3	8	1	0	1	1	0	0	0	2	.	250	2	0	0	4	0
546	644865d	60	2	1	5	5	3	2	3	17	1	0	0	1	0	1	0	4	.	0	2	0	0	4	0
547	640730d	23	2	2	3	1	12	1	3	9	0	0	1	1	0	0	0	1	0	0	2	0	0	4	0
548	637937d	22	6	1	3	4	2	4	3	18	0	0	0	1	0	0	0	7	.	0	2	0	0	4	0
549	638088d	25	2	1	5	5	2	1	1	5	1	0	1	0	0	0	0	10	.	0	2	0	0	4	0
550	635210d	37	3	2	1	1	0	1	3	8	0	0	0	0	0	0	0	4	.	0	2	1	7.5	2	1
551	637922d	65	2	1	5	1	1	2	3	9	0	0	0	1	0	0	0	1	.	200	2	0	0	1	2
552	635918d	26	2	2	2	1	6	1	3	1	1	0	0	0	0	0	0	10	0	0	2	0	0	4	0
553	634092d	54	10	1	5	4	12	8	3	17	0	0	1	1	0	0	0	1.5	.	150	1	0	0	3	1.5
554	637669d	39	2	2	3	1	36	1	3	21	1	0	0	0	0	0	0	1	.	250	2	2	15	1	2
555	634471d	51	6	1	6	4	3	2	3	9	0	0	0	0	0	0	0	2	.	200	2	2	15	3	2
556	635651d	54	1	2	1	1	1	2	3	9	1	0	1	0	0	0	0	1	.	200	1	0	0	4	0
557	634108d	47	2	1	1	6	8	1	3	3	1	0	0	1	0	0	0	8	.	250	1	2	30	4	0
558	633349d	58	11	1	3	4	1	2	3	12	1	0	1	1	0	1	1	2.5	.	250	2	1.5	22.5	4	0
559	633600d	34	16	1	5	4	0	1	3	4	0	0	0	0	0	0	0	10	.	0	2	0	0	4	0
560	636340d	57	1	1	3	7	2	7	3	7	1	0	0	1	0	1	1	1	.	250	2	0	0	4	0
561	614740d	61	1	2	2	1	2	1	3	21	0	0	1	0	0	0	0	1	120	50	1	0	0	4	0
562	640435d	52	2	1	3	6	1	2	3	19	1	0	0	0	0	1	1	2	.	50	2	0	0	4	0
563	643980d	58	2	1	5	5	4	2	3	17	0	0	0	0	0	1	0	1	.	1000	1	0	0	4	0
564	640708d	55	6	2	3	1	2	2	3	11	1	0	0	1	0	0	0	8	72	200	2	0	0	4	0
565	639914d	52	2	1	6	5	36	2	3	22	0	0	1	0	0	0	0	3.5	.	50	2	0	0	4	0
566	636152d	39	11	1	3	4	3	6	3	23	0	0	0	0	0	0	0	10	.	200	1	1	7.5	4	0
567	621522d	38	2	1	3	6	2	6	3	14	1	0	0	1	0	0	0	1	.	50	2	0	0	4	0
568	635186d	49	2	2	1	1	1	1	3	6	1	0	0	1	0	0	0	1	60	50	2	0	0	4	0
569	641594d	41	2	2	2	1	12	1	3	12	1	0	0	0	0	0	0	1	108	0	2	1	15	4	0
570	639473d	36	10	1	5	6	2	2	1	6	1	0	0	1	0	0	0	2.5	.	200	2	0	0	4	0
571	639924d	48	2	1	5	4	2	1	3	6	0	0	1	0	0	0	0	1	.	1000	2	0.5	7.5	4	0
572	638659d	64	3	1	3	5	3	2	3	22	1	0	0	1	0	0	0	6	.	1000	2	0	0	1	2
573	641033d	46	3	1	3	5	6	1	3	11	1	0	1	1	0	0	0	1	.	250	2	0.3	1.75	1	0.3
574	639089d	41	2	1	5	7	2	1	3	10	1	0	1	1	0	1	0	8	.	250	2	0.5	7.5	4	0
575	639251d	58	3	1	3	4	24	2	3	20	1	0	1	1	0	0	0	0.5	.	250	2	0	0	4	0
576	641434d	62	2	1	3	4	1	2	3	24	1	0	0	0	0	0	0	1	.	500	2	0	0	4	0
577	644633d	38	3	1	3	6	12	2	3	18	0	0	0	1	0	0	0	1	.	150	1	0	0	1	0.5
578	633011d	45	2	1	3	4	2	2	3	20	0	0	0	1	0	1	0	1	.	300	1	1	7.5	4	0
579	641328d	54	2	1	3	3	1	6	3	22	0	0	1	0	0	0	0	0	.	0	1	1	15	2	1
580	586481c	36	2	1	3	4	2	1	3	15	0	0	0	0	0	1	0	0.5	.	100	1	0	0	4	0
581	377098c	60	11	1	3	1	0	2	3	21	0	0	0	0	0	0	0	0.5	.	0	2	0.3	5	4	0
582	647849d	65	3	2	3	1	24	2	3	11	1	0	0	1	0	0	0	2	120	0	2	1	15	3	1
583	646412d	54	8	1	3	1	3	2	3	9	0	0	0	0	0	0	0	0.5	.	0	2	1	7.5	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
531	0	0	7	28	21	8	9	204	303	32	118	7	4	20	0.9	.	.	3	.	.	.	.	2	.	.	.
532	0	0	0	0	19	14	4	184	232	47	109	9	4	21	108	82	17	5	.	.	2	1	0	.	.	.
533	0	0	6	0	24	9	6	235	79	60	101	9	6	22	0.9	124	32	4	.	.	4	2	0	.	.	.
534	1000	1	1	0	22	7	6	80	94	22	36	9	4	.	123	98	25	3	.	.	5	2	0	.	.	.
535	0	0	1	0	21	9	3	136	174	23	81	8	3	18	135	112	31	4	.	.	.	.	2	.	.	.
536	0	0	0	0	18	8	17	148	211	32	78	8	10	12	0.9	.	.	4	.	.	.	.	2	.	.	.
537	1500	1	2	0	23	10	6	134	108	43	74	8	5	18	158	99	20	5	.	.	5	2	0	.	.	.
538	0	0	15	6	29	11	3	109	57	30	68	8	4	18	205	147	23	4	.	.	.	.	0	.	.	.
539	0	0	2	15	23	10	3	165	98	47	91	10	3	24	55	21	20	3	.	.	7	4	1	3	4	6
540	0	0	0	0	22	10	18	191	146	35	124	9	7	20	385	73	14	4	.	.	5	2	0	.	.	.
541	1000	1	8	0	25	6	9	177	212	34	115	8	5	10	447	72	15	4	.	.	.	.	0	.	.	.
542	0	0	0	3	25	9	6	125	93	27	81	8	5	16	0.9	.	.	4	.	.	.	.	0	.	.	.
543	0	0	0	0	21	10	12	171	51	64	87	9	7	15	167	139	17	5	.	.	2	1	0	.	.	.
544	0	0	0	0	15	10	8	218	135	84	109	4	7	16	1114	292	15	4	.	.	1	1	0	.	.	.
545	0	0	10	20	23	9	7	83	133	28	36	8	5	15	276	273	21	3	.	.	3	1	0	.	.	.
546	0	0	15	15	24	8	4	148	90	38	85	9	4	29	147	210	10	3	.	.	4	2	0	.	.	.
547	0	0	1	0	.	6	8	160	119	28	111	9	8	12	0.9	.	.	4	.	.	.	.	2	.	.	.
548	0	0	0	0	16	13	3	.	.	.	.	8	3	23	64	.	44	4	.	.	4	1	0	.	.	.
549	0	0	0	0	19	7	14	112	121	19	50	10	4	17	233	68	19	3	.	.	6	3	0	.	.	.
550	0	0	0	0	23	11	5	132	74	36	80	8	3	20	362	85	31	4	.	.	3	1	0	.	.	.
551	1000	2	4	4	22	9	5	121	84	47	55	8	5	17	297	76	15	3	.	.	1	1	0	.	.	.
552	0	0	0	0	18	7	29	125	179	23	49	10	11	14	0.9	.	.	3	.	.	.	.	2	.	.	.
553	0	0	4	0	26	12	4	188	164	32	126	8	5	26	189	93	16	5	.	.	3	2	0	.	.	.
554	1000	2	16	0	21	9	3	106	40	47	58	8	5	17	74	57	29	4	.	.	1	1	0	.	.	.
555	0	0	14	14	24	10	7	243	144	63	147	9	4	20	218	61	6	3	.	.	3	1	0	.	.	.
556	0	0	3	8	25	9	7	.	.	.	.	8	7	16	235	.	.	4	.	.	.	.	2	.	.	.
557	1000	2	0	0	22	5	17	95	98	23	51	7	11	7	2500	250	35	4	.	.	7	3	0	.	.	.
558	1000	1.5	9	23	20	8	5	178	140	48	114	8	4	27	488	191	23	3	.	.	5	2	0	.	.	.
559	0	0	15	0	21	6	14	115	37	45	60	5	8	6	903	76	21	4	.	.	1	1	0	.	.	.
560	0	0	10	0	23	7	9	169	117	36	111	6	6	12	897	148	22	4	.	.	4	2	0	.	.	.
561	0	0	3	0	19	9	3	114	83	32	65	10	4	21	27	61	45	4	.	.	4	2	0	.	.	.
562	0	0	8	15	25	7	4	83	141	31	25	9	5	16	153	79	14	4	.	.	3	2	0	.	.	.
563	0	0	0	3	21	10	4	139	101	49	69	9	4	25	198	127	7	2	.	.	.	.	2	.	.	.
564	0	0	0	5	31	5	4	123	117	32	58	5	5	16	567	170	14	4	.	.	5	2	0	.	.	.
565	0	0	5	0	26	12	3	164	266	28	77	9	4	23	272	74	15	3	.	.	4	2	1	1	1	2
566	1000	1	3	0	18	10	3	146	74	43	80	8	3	23	123	57	34	4	.	.	5	2	0	.	.	.
567	0	0	0	0	28	11	5	151	399	20	68	9	5	24	157	70	40	4	.	.	.	.	0	.	.	.
568	0	0	0	0	21	6	9	150	119	47	78	7	8	20	0.9	.	.	4	.	.	.	.	0	.	.	.
569	1000	1	2	0	18	10	4	180	158	43	100	8	4	23	519	133	27	5	.	.	2	2	0	.	.	.
570	0	0	0	0	25	8	11	111	162	17	55	6	6	21	720	79	16	4	.	.	2	2	0	.	.	.
571	1000	0.5	3	0	25	9	10	104	104	34	59	7	7	18	523	85	31	5	.	.	2	1	0	.	.	.
572	1000	2	8	8	19	10	3	114	47	47	51	8	4	17	95	85	19	4	.	.	5	2	0	.	.	.
573	1000	0.3	10	0	30	10	6	67	73	23	29	9	5	15	361	103	37	5	.	.	3	2	0	.	.	.
574	1000	0.5	0	0	17	7	6	196	79	49	118	8	5	13	0.9	106	39	4	.	.	.	.	0	.	.	.
575	0	0	11	11	20	11	3	169	155	31	108	8	3	23	369	159	19	4	.	.	3	2	0	.	.	.
576	0	0	2	6	23	10	3	200	354	27	113	8	3	18	189	44	12	5	.	.	0	0	0	.	.	.
577	1000	0.5	1	15	19	8	4	159	126	33	95	8	4	15	238	371	34	1	.	.	5	2	0	.	.	.
578	2000	1	10	2	22	9	3	94	48	40	40	8	5	24	170	93	47	4	.	.	6	3	0	.	.	.
579	500	1	5	0	18	8	3	96	71	23	61	9	3	16	0.9	.	.	4	.	.	.	.	2	.	.	.
580	0	0	1	10	22	6	4	133	77	31	77	8	5	16	157	113	48	3	.	.	6	3	0	.	.	.
581	1000	0.3	7	18	26	7	6	142	85	24	84	8	5	20	587	180	25	4	.	.	3	1	0	.	.	.
582	1500	1	2	2	27	10	7	102	130	29	49	8	5	21	164	104	10	4	.	.	4	2	0	.	.	.
583	0	0	12	7	19	13	7	169	117	26	117	9	5	15	16	82	22	4	.	.	.	.	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
584	646982d	54	1	2	1	2	2	1	3	4	1	0	1	0	0	0	0	0	84	250	1	0	0	4	0
585	646273d	30	11	1	3	2	3	1	3	7	1	0	0	0	0	0	0	3	.	50	2	0.5	3.75	4	0
586	646773d	51	2	1	2	4	3	2	3	12	0	0	0	0	0	0	0	0.5	.	100	2	0.3	5	4	0
587	646450d	50	2	1	1	2	6	1	3	14	1	0	0	0	0	0	0	8	.	0	2	0	0	4	0
588	646524d	23	2	1	5	1	36	1	3	4	1	0	0	0	0	0	0	5	.	250	2	0	0	4	0
589	642739d	62	2	1	3	1	24	2	3	15	0	0	1	0	0	0	0	0.5	.	100	2	0	0	4	0
590	643853d	59	2	1	5	4	3	1	3	25	1	0	0	0	0	0	0	0.5	.	100	1	0	0	4	0
591	651759d	54	2	1	3	5	1	2	3	5	0	0	1	0	0	0	0	1	.	0	2	0	0	4	0
592	648128d	56	1	1	3	2	1	1	3	4	1	0	1	0	0	1	0	4	.	50	2	0	0	4	0
593	649149d	20	2	1	3	7	3	1	3	11	0	0	0	1	0	0	0	6	.	50	2	0	0	4	0
594	647711d	61	2	2	2	1	0	2	3	25	0	0	0	0	0	0	0	1	180	100	2	0	0	4	0
595	633442d	38	3	1	5	5	2	1	3	30	0	0	1	0	0	0	0	0.5	.	500	2	2	15	1	2
596	647576d	53	2	1	2	6	12	1	3	5	1	0	1	0	0	1	0	1	.	50	1	0	0	4	0
597	650427d	29	13	1	3	6	3	1	3	7	0	0	0	1	0	0	0	0.5	.	250	1	1	15	4	0
598	647859d	18	2	1	3	1	6	1	3	4	1	0	1	1	0	0	0	0.5	.	100	2	0	0	4	0
599	652329d	55	3	2	1	1	3	1	3	21	1	0	0	0	0	0	0	0.5	60	100	2	1	7.5	4	0
600	653116d	44	2	2	3	1	120	1	3	13	1	0	0	0	0	0	0	0	0	100	2	0	0	4	0
601	638508d	37	1	1	3	2	1	1	3	15	0	0	0	0	0	0	0	10	.	100	2	0	0	4	0
602	637348d	48	3	2	3	1	0	2	3	24	0	0	0	0	0	0	0	0.5	0	200	2	0	0	3	0.5
603	648647d	47	11	1	3	5	60	2	3	16	0	0	1	1	0	0	0	2	.	50	2	0	0	2	2
604	636907d	55	2	2	5	1	6	2	3	16	1	0	0	0	0	0	0	0.5	24	250	2	0	0	4	0
605	649312d	31	11	1	3	2	2	1	1	6	0	0	0	0	0	1	0	0.5	.	50	2	1	7.5	2	1
606	645830d	50	2	1	3	4	0	6	3	8	0	0	0	0	0	1	0	1	.	100	2	0	0	1	1
607	647678d	68	2	1	5	1	18	2	3	12	1	0	1	1	0	1	0	0.5	.	0	2	0	0	4	0
608	653874d	64	3	1	3	1	1	1	3	7	0	0	0	1	0	0	0	2	.	200	2	1	15	4	0
609	224421c	59	1	1	5	1	0	2	3	24	0	0	1	0	0	0	0	1	.	200	2	0	0	4	0
610	657510d	14	1	1	1	1	1	1	3	7	0	0	1	0	0	0	0	0.5	.	200	1	0	0	4	0
611	654787d	39	10	1	5	6	24	1	3	3	1	0	0	0	0	1	1	2	.	100	2	0	0	1	0.3
612	655183d	47	6	1	3	6	1	2	3	7	0	0	0	0	0	1	0	0.5	.	0	1	0	0	4	0
613	650849d	62	2	2	2	1	12	1	3	8	1	0	1	1	0	0	0	0.5	240	100	1	1	7.5	4	0
614	652642d	36	6	1	5	5	0	1	3	14	0	0	0	0	0	0	0	1.5	.	150	2	0	0	4	0
615	653677d	31	19	1	6	5	3	4	3	14	0	0	1	0	0	0	0	0.5	.	100	2	0	0	4	0
616	655271d	54	1	1	1	1	60	2	3	14	1	0	0	0	0	0	0	3	.	50	2	0	0	4	0
617	585823d	54	15	1	6	7	12	1	3	24	0	0	1	0	0	1	0	1	.	150	2	0	0	4	0
618	655188d	49	6	1	1	1	2	3	3	22	1	0	0	0	0	0	0	2	.	0	2	0	0	1	1
619	655931d	42	2	2	3	1	1	1	3	20	1	0	0	0	0	0	0	8	0	50	2	0.5	3.75	1	0.5
620	655023d	44	3	1	2	6	1	1	3	6	0	0	1	0	0	0	0	0.5	.	250	2	0	0	4	0
621	657910d	32	1	1	5	4	1	1	3	13	1	0	0	0	0	0	0	0.5	.	300	2	1	15	4	0
622	657442d	73	11	1	6	1	0	1	3	26	0	0	0	0	0	0	0	2	.	200	2	0	0	4	0
623	662118d	37	2	2	2	7	0	2	3	16	0	0	0	0	0	0	0	0.5	0	0	2	0	0	1	0.5
624	722712d	60	16	1	5	3	3	1	3	8	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
625	717420d	53	2	1	3	6	1	1	3	7	0	0	0	0	0	0	0	1	.	0	2	1	7.5	1	1
626	725325d	33	2	2	3	1	6	1	3	6	0	0	0	0	0	0	0	0.5	0	500	2	0	0	4	0
627	705240d	62	6	1	5	1	3	2	3	6	0	0	1	0	0	1	1	0.5	.	400	1	0	0	4	0
628	722933d	40	2	1	3	4	3	1	3	11	0	0	0	1	0	0	0	0.5	.	0	2	1	7.5	1	1
629	723654d	52	1	1	6	5	3	5	3	5	0	0	0	0	0	0	0	0.5	.	400	2	0	0	4	0
630	718599d	55	2	1	3	5	2	2	3	13	0	0	0	1	0	0	0	0.5	.	300	2	0	0	1	1
631	688624d	60	1	2	3	1	7	2	3	6	0	0	0	0	0	0	0	0.5	120	0	2	0	0	4	0
632	447032c	49	1	1	3	2	1	2	3	22	0	0	0	0	0	0	0	1.5	.	200	2	0	0	4	0
633	721002d	45	7	1	2	3	12	1	3	7	0	0	0	0	0	0	0	2.5	.	200	2	0	0	4	0
634	721707d	52	2	1	3	3	12	1	3	11	1	0	0	0	0	1	0	2	.	0	2	0	0	4	0
635	716404d	39	9	2	3	1	4	1	3	16	0	0	0	0	0	0	0	0.5	.	0	1	0	0	4	0
636	718429d	60	3	1	5	1	1	2	3	11	0	0	1	1	0	0	0	0.5	.	500	1	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
584	0	0	8	0	21	10	12	217	131	52	139	8	6	17	461	83	.	4	.	.	11	4	0	.	.	.
585	0	0	0	0	17	8	10	138	106	49	68	9	8	10	376	100	26	4	.	.	.	.	0	.	.	.
586	500	0.3	4	5	18	7	6	159	271	32	84	9	4	23	224	67	28	4	.	.	2	2	0	.	.	.
587	0	0	0	0	18	8	5	116	39	53	54	9	5	18	63	101	22	4	.	.	3	2	0	.	.	.
588	0	0	0	0	20	7	16	147	107	36	87	8	7	21	973	109	15	5	.	.	8	4	0	.	.	.
589	0	0	8	15	27	8	4	160	75	46	103	9	4	23	118	151	14	3	.	.	.	.	0	.	.	.
590	0	0	10	20	25	12	3	175	137	33	110	8	3	23	0.9	102	18	4	.	.	1	1	1	3	5	5
591	0	0	3	3	20	7	11	203	77	63	123	8	6	17	483	83	20	3	.	.	4	2	2	.	.	.
592	0	0	0	0	24	10	13	.	.	.	.	8	5	12	225	.	.	4	.	.	.	.	2	.	.	.
593	0	0	1	0	18	7	7	113	57	37	61	8	6	17	363	60	21	3	.	.	4	3	0	.	.	.
594	0	0	5	15	26	10	3	194	426	40	72	9	4	20	292	118	10	3	.	.	.	.	2	.	.	.
595	500	2	0	0	26	12	3	154	175	26	93	8	3	17	356	282	24	5	.	.	5	3	2	.	.	.
596	0	0	3	0	19	8	11	163	81	39	103	7	8	9	1062	159	27	4	.	.	5	3	0	.	.	.
597	1500	1	0	0	22	7	10	207	58	41	129	9	5	14	258	79	23	4	.	.	6	3	0	.	.	.
598	0	0	0	0	24	6	13	153	86	43	97	5	9	.	0.9	.	.	3	.	.	.	.	2	.	.	.
599	1000	1	0	0	21	9	3	146	153	26	86	8	5	19	148	.	31	5	.	.	6	2	0	.	.	.
600	0	0	5	0	26	9	4	156	80	46	91	8	6	12	128	50	20	5	.	.	6	3	0	.	.	.
601	0	0	0	0	24	11	5	143	233	18	82	.	.	.	0.9	.	.	.	.	.	.	.	2	.	.	.
602	0	0	13	13	25	11	2	392	412	49	237	9	4	.	189	68	7	3	.	.	5	2	0	.	.	.
603	0	0	3	14	27	9	4	261	396	33	163	9	4	19	192	182	10	3	.	.	3	1	0	.	.	.
604	0	0	2	13	.	8	3	180	153	45	114	9	4	.	0.9	133	.	4	.	.	6	3	2	.	.	.
605	0	0	0	0	17	10	11	139	121	35	79	8	5	20	213	83	17	5	.	.	.	.	0	.	.	.
606	1000	1	3	3	23	8	8	168	64	60	89	7	5	15	434	155	27	3	.	.	8	4	0	.	.	.
607	0	0	1	25	20	8	5	131	60	51	65	7	5	11	338	136	22	4	.	.	4	2	1	2	2	3
608	1000	1	8	0	22	9	8	178	124	67	74	8	6	18	270	97	26	4	.	.	7	3	0	.	.	.
609	0	0	10	10	20	11	3	143	87	51	60	9	4	21	184	97	19	4	.	.	6	3	0	.	.	.
610	0	0	1	0	.	4	11	132	139	28	81	5	10	12	517	84	22	3	.	.	4	1	2	.	.	.
611	1000	0.3	2	0	25	7	17	104	98	21	67	4	7	14	504	362	23	5	.	.	6	2	2	.	.	.
612	500	1	1	10	22	9	9	.	.	.	.	8	6	13	116	80	24	4	.	.	6	2	0	.	.	.
613	500	1	0	0	25	10	5	136	70	36	80	8	4	19	504	162	35	4	.	.	5	1	0	.	.	.
614	0	0	0	0	23	9	5	124	80	39	67	8	4	18	261	77	16	4	.	.	8	3	0	.	.	.
615	0	0	4	0	20	10	5	138	89	41	78	8	4	21	456	80	10	5	.	.	8	4	0	.	.	.
616	0	0	8	15	23	9	5	153	178	23	99	8	3	20	561	111	.	4	.	.	.	.	2	.	.	.
617	0	0	1	0	25	7	3	.	.	.	.	7	4	14	508	186	16	4	.	.	4	2	0	.	.	.
618	1000	1	3	0	26	12	3	118	165	34	54	9	3	20	103	83	18	5	.	.	2	1	0	.	.	.
619	1000	0.5	0	0	16	8	4	178	109	59	95	9	7	15	53	56	25	4	.	.	6	2	0	.	.	.
620	0	0	1	0	24	8	9	197	280	32	120	9	6	17	0.9	.	.	4	.	.	.	.	2	.	.	.
621	1000	1	2	1	20	13	5	136	111	23	93	8	4	16	458	96	28	3	.	.	.	.	0	.	.	.
622	0	0	29	0	24	10	3	128	97	35	75	7	3	24	146	70	19	4	.	.	4	2	0	.	.	.
623	1000	0.5	1	12	17	11	4	138	148	35	74	9	4	30	119	398	14	4	.	.	3	1	0	.	.	.
624	0	0	0	0	21	8	8	124	52	39	73	7	6	.	439	159	25	5	0.972	0.3	5	2	0	.	.	.
625	500	1	1	0	21	10	9	205	151	40	135	8	4	17	601	179	14	5	.	.	6	3	0	.	.	.
626	0	0	3	0	24	8	9	154	84	43	97	5	7	13	0.9	.	.	4	.	.	.	.	2	.	.	.
627	0	0	3	8	25	8	9	99	75	29	54	7	5	13	595	145	22	4	.	.	7	3	0	.	.	.
628	1000	1	7	0	21	10	6	205	118	52	118	9	4	17	343	90	16	4	0.775	-1.1	9	3	0	.	.	.
629	0	0	0	0	23	8	12	127	103	27	74	6	7	6	607	85	13	5	.	.	5	2	0	.	.	.
630	1000	1	1	12	21	7	5	99	65	43	35	8	5	22	299	136	17	4	0.616	-2.3	9	3	0	.	.	.
631	0	0	8	25	33	11	8	231	139	29	174	9	6	22	1009	127	7	3	.	.	6	3	0	.	.	.
632	0	0	5	5	29	10	3	168	154	25	113	8	6	21	71	75	21	3	.	.	.	.	0	.	.	.
633	0	0	12	0	23	11	9	124	89	24	87	7	7	14	515	108	26	5	.	.	8	3	0	.	.	.
634	0	0	13	0	22	10	6	.	.	.	.	8	5	17	361	97	17	4	.	.	1	1	0	.	.	.
635	0	0	0	0	17	11	3	158	133	52	73	9	5	14	42	86	23	4	.	.	4	1	0	.	.	.
636	0	0	3	3	21	11	6	95	121	23	50	8	3	13	140	101	.	4	.	.	3	1	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
637	697286d	39	2	1	3	4	6	1	3	21	0	0	1	0	0	0	0	2	.	0	2	0	0	4	0
638	718257d	45	2	2	2	1	6	1	3	7	1	0	0	0	0	0	0	0.5	0	0	2	1	15	1	1
639	717713d	55	3	1	2	2	6	1	3	23	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
640	717821d	65	5	1	2	2	1	1	3	20	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
641	722537d	35	1	2	5	1	0	2	3	9	0	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
642	663309d	34	4	1	3	6	0	2	1	8	0	0	0	0	0	0	0	0.5	.	300	2	1	7.5	4	0
643	662887d	71	22	1	3	1	3	1	3	10	0	0	1	0	0	0	0	0.5	.	0	2	0	0	4	0
644	657184d	52	2	1	3	7	48	1	3	23	0	0	0	1	0	1	0	0.5	.	0	2	0	0	4	0
645	662004d	26	3	1	3	3	1	1	3	7	1	0	0	1	0	0	0	0.5	.	1000	2	0	0	4	0
646	659670d	41	12	1	5	6	12	1	3	9	0	0	1	1	0	0	0	0.5	.	100	2	0	0	2	1
647	658882d	48	18	1	3	6	2	1	3	4	1	0	1	1	0	0	0	0.5	.	0	2	0.5	7.5	4	0
648	659166d	28	6	2	3	1	12	1	3	4	1	0	1	1	0	0	0	0.5	0	0	2	0.5	7.5	4	0
649	659557d	27	11	1	5	5	24	1	3	27	1	0	0	1	0	0	0	0.5	.	100	2	0	0	4	0
650	656676d	58	2	1	5	5	2	2	3	11	1	0	1	1	0	0	0	0.5	.	0	2	0	0	4	0
651	656150d	26	2	1	3	3	3	1	1	5	1	0	0	1	0	0	0	5	.	250	2	0.5	7.5	4	0
652	654051d	51	2	1	3	6	2	1	3	2	0	0	0	1	0	1	0	0.5	.	0	2	0	0	4	0
653	652703d	52	8	2	3	1	3	1	3	9	0	0	1	0	0	0	0	0.5	36	200	2	0.66	5	4	0
654	653867d	62	2	1	2	1	0	1	3	24	0	0	0	0	0	0	0	8	.	500	2	0	0	4	0
655	653518d	58	4	1	3	4	48	2	3	9	1	0	0	0	0	1	1	10	.	200	2	0	0	4	0
656	641358d	40	2	2	3	1	36	3	3	9	1	0	0	0	0	0	0	0.5	0	500	1	0	0	4	0
657	650272d	66	3	1	3	1	3	2	3	23	1	0	0	1	0	0	0	0.5	.	500	2	1	7.5	1	1
658	645123d	58	2	1	5	4	24	2	3	14	0	0	1	0	0	1	0	0.5	.	200	2	0	0	4	0
659	600684d	49	1	1	3	2	1	2	3	3	0	0	1	0	0	0	0	1	.	100	2	0	0	4	0
660	581452d	50	9	1	1	3	0	1	3	18	1	0	0	0	0	0	0	0	.	0	2	0	0	4	0
661	922331a	39	1	2	2	1	2	1	3	4	1	0	0	0	0	0	0	0	0	0	2	0	0	4	0
662	593954d	62	1	1	2	1	1	1	2	3	0	0	0	0	0	0	1	1	.	0	2	0	0	4	0
663	600409d	30	8	1	5	5	1	1	1	3	0	0	0	0	0	0	0	0	.	100	2	1.5	11.3	4	0
664	511883c	55	2	1	5	5	3	2	3	27	0	0	1	0	0	0	1	0	.	100	2	0	0	4	0
665	600423d	42	2	1	3	3	2	1	3	18	1	0	1	0	0	0	0	0	.	100	2	0	0	1	0.3
666	600359d	45	2	2	3	1	36	1	3	4	0	0	1	0	0	0	0	0	60	0	1	0	0	4	0
667	599819d	30	3	1	5	4	2	5	1	5	0	0	0	0	0	0	0	0	.	100	2	1	15	4	1
668	5.83d	62	2	1	1	3	3	2	3	15	0	0	1	1	0	0	1	0	.	200	2	0.3	1.75	4	0.3
669	600805d	37	2	1	5	3	6	1	3	9	1	0	0	0	0	0	1	0	.	250	2	0	0	4	0
670	600763d	40	1	1	3	4	3	1	3	7	0	0	0	0	0	0	0	0	.	200	2	2	30	1	1
671	595225d	52	15	1	5	4	6	2	3	8	1	0	1	0	0	0	1	1	.	100	2	0.1	2.5	4	0
672	596705d	57	3	1	5	4	2	2	1	8	0	0	0	0	0	0	1	0	.	200	2	0.1	0.5	4	0
673	600010d	52	2	1	3	1	3	2	3	8	0	1	0	0	0	0	0	0	.	0	2	0	0	4	0
674	596450d	75	3	1	3	6	2	1	3	22	0	0	0	0	0	0	0	0	.	400	2	0	0	3	0.3
675	598204d	33	13	1	3	5	2	1	3	5	0	0	0	0	0	0	1	1	.	400	2	0	0	4	0
676	599256d	46	3	1	2	1	2	2	3	15	0	0	0	0	0	0	0	0	.	200	2	0.5	3.75	1	0.5
677	601513d	51	2	1	4	4	24	2	3	13	1	0	1	0	0	0	0	0	.	500	2	1	7.5	4	0
678	602933d	51	9	2	3	1	1	1	3	28	0	0	0	0	0	0	0	0	.	0	2	0	0	4	0
679	604675d	61	9	1	2	3	2	2	3	13	1	0	1	0	0	0	0	0	.	0	1	0.3	7.5	4	0
680	600914d	52	6	2	1	1	0	2	3	23	1	0	0	0	0	0	0	0	.	500	1	0	0	4	0
681	601873d	44	2	1	5	5	6	1	3	24	0	0	1	0	0	0	0	0	.	0	1	0	0	4	0
682	604726d	26	5	1	6	1	1	1	3	2	0	0	0	0	0	0	0	0	.	0	2	0	0	4	0
683	602342d	23	2	2	4	4	1	1	3	5	0	0	0	1	0	0	0	0	.	500	2	0	0	4	0
684	580242d	42	1	2	3	1	0	1	3	25	1	0	0	0	0	0	0	0	2	100	2	0	0	4	0
685	600476d	17	1	1	3	1	1	1	1	4	0	0	0	0	0	0	0	0	.	100	2	0	0	4	0
686	599617d	58	2	2	3	1	6	1	3	6	1	0	1	1	0	0	0	0	60	0	2	0	0	4	0
687	599034d	27	16	2	5	5	2	1	1	8	0	0	0	1	0	0	0	0	0	200	2	0	0	4	0
688	596675d	52	2	1	5	5	6	2	3	15	0	0	0	0	0	0	1	0	.	100	2	0	0	4	0
689	601896d	58	1	2	1	1	1	2	3	8	1	0	0	0	0	0	0	0	.	200	2	0	0	3	1

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
637	0	0	0	0	20	10	4	138	237	24	72	9	2	.	0.9	66	.	4	.	.	.	.	2	.	.	.
638	1000	1	1	0	26	8	7	122	85	30	80	9	7	12	1086	100	20	4	.	.	5	2	0	.	.	.
639	0	0	0	0	23	7	3	164	101	41	98	8	4	21	70	66	20	4	.	.	.	.	0	.	.	.
640	0	0	18	8	21	12	3	.	.	.	.	9	3	.	0.9	.	.	4	.	.	9	3	0	.	.	.
641	0	0	8	8	35	8	6	126	88	37	64	7	3	14	345	106	11	4	.	.	6	2	0	.	.	.
642	1000	1	0	5	24	11	8	255	245	28	191	9	5	22	198	69	15	4	.	.	5	2	0	.	.	.
643	0	0	4	0	25	10	6	158	60	70	74	8	5	12	1015	147	14	4	.	.	4	1	0	.	.	.
644	0	0	6	0	16	12	3	118	63	41	59	8	5	17	152	94	18	4	.	.	5	2	0	.	.	.
645	0	0	0	0	17	5	13	189	98	54	100	7	6	14	0.9	.	.	4	.	.	.	.	2	.	.	.
646	0	0	1	0	19	11	7	176	95	51	108	8	6	16	258	110	26	4	.	.	4	2	0	.	.	.
647	1000	0.5	1	0	19	8	8	91	64	38	45	8	7	10	798	139	15	3	.	.	4	2	0	.	.	.
648	1000	0.5	5	0	22	7	11	150	202	26	87	8	11	11	1058	113	21	4	.	.	5	2	0	.	.	.
649	0	0	0	0	20	10	3	173	105	41	116	8	4	20	133	76	20	4	.	.	4	3	0	.	.	.
650	0	0	1	3	24	7	6	183	216	42	97	9	4	22	280	52	16	2	.	.	2	1	2	.	.	.
651	1000	0.5	0	0	20	10	13	152	160	41	82	8	7	19	390	53	32	4	.	.	9	4	2	.	.	.
652	0	0	1	10	20	7	23	.	.	.	.	.	.	7	0.9	234	.	4	.	.	.	.	2	.	.	.
653	0	0	7	0	20	11	7	226	169	32	168	7	6	12	831	172	27	5	.	.	6	4	0	.	.	.
654	0	0	4	0	26	11	3	185	90	34	129	8	3	23	168	90	16	4	.	.	3	1	0	.	.	.
655	0	0	3	3	24	13	6	191	92	50	117	9	5	22	738	124	23	5	.	.	5	1	0	.	.	.
656	0	0	0	0	17	6	5	177	385	40	89	5	4	27	619	173	20	4	.	.	.	.	0	.	.	.
657	1000	1	20	20	24	8	3	139	140	32	72	9	5	21	72	169	10	3	.	.	7	2	0	.	.	.
658	0	0	2	16	22	11	4	.	.	.	.	8	5	23	382	110	16	4	.	.	6	2	0	.	.	.
659	0	0	5	7	25	8	16	198	126	47	123	7	11	13	1303	119	28	4	0.723	-1.5	0	0	0	.	.	.
660	0	0	4	0	19	11	4	115	56	40	52	9	4	22	158	59	39	4	0.685	-1.8	.	.	0	.	.	.
661	0	0	3	0	.	8	10	107	87	31	54	8	7	19	1507	101	34	4	0.773	-0.7	4	2	2	.	.	.
662	3000	0.3	3	0	.	8	15	205	206	31	132	7	9	17	548	.	23	3	0.841	-0.7	11	4	0	.	.	.
663	1000	1.5	0	0	26	5	20	88	177	18	38	8	7	14	443	67	20	4	0.816	-0.8	.	.	0	.	.	.
664	0	0	15	15	25	3	3	146	171	28	79	9	3	25	60	77	26	4	0.703	-1.3	0	0	0	.	.	.
665	0	0	0	0	16	.	4	67	48	21	23	8	6	12	355	94	52	4	.	.	0	0	0	.	.	.
666	0	0	2	0	24	7	11	175	93	68	79	8	7	14	536	131	24	3	0.496	-3.2	3	1	0	.	.	.
667	0	0	0	0	22	6	14	126	90	54	47	8	5	20	677	111	18	4	0.593	-2.5	5	3	0	.	.	.
668	0	0	0	1	25	12	4	151	93	32	85	8	3	26	69	84	36	5	0.731	-1.5	.	.	0	.	.	.
669	0	0	1	0	19	8	7	196	71	52	110	7	6	15	377	129	30	4	0.638	-2.1	1	0	0	.	.	.
670	1000	2	0	0	17	8	9	111	85	41	48	9	8	14	100	67	38	4	1.01	0.6	0	0	0	.	.	.
671	0	0	1	18	21	12	8	186	139	41	116	8	6	19	389	59	19	4	0.535	-2.9	.	.	0	.	.	.
672	1000	0.1	7	7	21	6	7	194	161	48	93	8	6	25	729	66	21	3	0.639	-2.1	3	1	1	3	3	4
673	0	0	15	15	23	8	6	308	355	70	157	9	6	19	464	138	12	3	0.55	-2.7	6	3	0	.	.	.
674	0	0	12	0	29	11	3	167	192	40	84	9	4	26	369	66	17	4	0.772	-1.2	4	2	0	.	.	.
675	0	0	3	0	18	8	13	109	41	36	57	7	8	14	428	67	35	4	0.707	-1.6	4	2	0	.	.	.
676	0	0	2	0	.	8	5	93	140	27	34	9	5	18	223	91	24	3	0.752	-1.3	2	1	0	.	.	.
677	0	0	2	10	23	8	5	194	82	58	107	9	5	23	342	61	26	4	0.658	-2	4	3	2	.	.	.
678	0	0	3	0	26	11	2	131	141	22	72	9	4	21	34	65	44	4	0.695	-1.4	5	3	0	.	.	.
679	1500	0.3	2	10	25	11	5	162	120	47	72	9	4	25	535	94	14	4	0.707	-1.6	1	1	0	.	.	.
680	0	0	0	3	29	10	2	124	95	40	45	9	4	20	60	60	29	5	0.744	-0.9	5	3	0	.	.	.
681	0	0	6	0	21	10	3	169	85	28	116	9	4	26	177	104	18	3	0.619	-2.1	5	3	1	2	3	4
682	0	0	0	0	18	6	28	231	481	20	109	4	13	7	1082	79	18	4	.	.	6	4	0	.	.	.
683	0	0	6	0	21	8	11	271	282	26	156	5	7	17	301	109	20	4	0.693	-1.4	2	1	0	.	.	.
684	0	0	7	0	34	8	2	232	191	31	152	9	4	23	0.9	85	26	4	0.592	-2.3	7	4	0	.	.	.
685	0	0	0	0	19	5	17	130	104	29	69	8	12	22	1796	38	24	3	0.711	.	2	1	2	.	.	.
686	0	0	4	0	.	8	7	145	82	33	80	9	9	20	320	59	25	4	0.46	-3.5	4	3	0	.	.	.
687	0	0	0	0	19	6	7	110	52	39	57	8	4	20	718	66	31	5	0.855	-1.2	1	0	0	.	.	.
688	0	0	10	16	20	9	4	149	75	39	82	8	3	17	228	111	30	4	0.571	-2.6	5	3	0	.	.	.
689	0	0	2	2	20	6	6	204	179	41	118	9	6	22	557	118	17	4	0.569	-2.5	3	1	0	.	.	.

S.no	H.No	Age	Res	Sex	Edu	Occ	Symp	nkd	dial	gfr	pain	frac	prur	prox	para	smok	alc	sun	amen	milk	diet	vdur	vdos	bind	bdur
690	767183d	62	3	1	3	1	12	1	3	18	0	0	1	1	0	0	0	8	.	100	2	0	0	1	1
691	766142d	29	2	2	5	1	3	1	1	13	0	0	0	1	0	0	0	0.5	0	200	1	1.5	10.3	4	0
692	769175d	59	2	1	5	4	3	1	3	6	0	0	1	0	0	0	0	2	.	0	2	1	7.5	4	0
693	752040d	62	2	1	5	5	1	1	3	17	0	0	0	0	0	0	0	0.5	.	0	2	0	0	4	0
694	741435d	55	3	1	1	3	6	1	3	19	1	0	0	0	0	0	0	6	.	0	1	0	0	4	0
695	735819d	51	2	2	2	1	36	2	3	26	1	0	0	0	0	0	0	0.5	0	0	2	0	0	4	0
696	678190d	32	8	1	3	6	1	1	3	5	1	0	1	1	0	0	0	0.5	.	200	2	1	3.65	4	0
697	671873d	50	13	2	2	1	6	2	3	10	1	0	0	1	0	0	0	1	60	0	1	0	0	4	0
698	695371d	25	1	2	5	1	1	1	3	5	0	0	0	0	0	0	0	0.5	0	100	2	1	7.5	4	0
699	678963d	59	5	1	1	3	1	1	3	27	0	0	0	0	0	1	0	4.5	.	200	2	0	0	4	0
700	688722d	32	1	2	2	2	2	1	3	3	1	0	1	1	0	0	0	0.5	0	250	2	2	30	4	0
701	689469d	45	3	1	5	2	0	1	3	27	0	0	0	0	0	0	0	4	.	0	2	0	0	4	0
702	687720d	40	8	1	5	1	0	1	1	5	0	0	0	0	0	1	0	6	.	0	2	1	7.5	4	0
703	688080d	35	1	1	2	2	2	1	2	2	0	0	0	1	0	0	0	8	.	100	2	0.3	5	4	0
704	623516d	22	3	1	4	1	0	1	1	4	0	0	0	0	0	0	0	1.5	.	0	2	0.5	3.65	4	0
705	635839d	48	1	2	3	1	0	8	3	23	1	0	0	1	0	0	0	3	144	200	2	0	0	4	0
706	757075d	33	2	1	3	3	0	1	3	29	0	0	0	0	0	0	0	3	.	200	2	0	0	4	0
707	627009d	79	5	1	1	3	0	1	3	29	0	0	0	0	0	0	0	1	.	0	2	0	0	4	0
708	629065d	49	4	1	3	5	0	2	3	14	0	0	0	0	0	1	0	0.5	.	500	2	0	0	4	0
709	635745d	60	3	2	3	1	3	2	3	23	0	0	1	1	0	0	0	2	120	250	2	0	0	4	0
710	762758d	46	1	2	3	1	0	1	3	8	0	0	0	0	0	0	0	0.5	0	200	2	0	0	4	0

S.no	cdos	cdur	ht	dm	bmi	hb	cr	chol	tg	hdl	ldl	ca	phos	bic	pth	alp	vitd	alb	bmd	tscor	echo1	echo2	Xray	ass	apas	apss
690	1000	1	1	3	18	9	4	155	62	43	97	8	3	15	103	208	.	4	1	0.5	6	2	0	.	.	.
691	500	1.5	0	0	24	9	4	.	.	.	.	8	4	18	430	147	15	4	0.628	-2	4	1	0	.	.	.
692	500	1	18	0	24	8	7	.	.	.	.	8	7	11	1574	106	41	4	.	.	3	1	0	.	.	.
693	0	0	1	0	20	6	4	141	239	32	76	8	4	19	155	.	5	5	0.578	-2.6	3	2	0	.	.	.
694	0	0	0	0	17	10	2	.	.	.	.	8	3	17	127	244	32	4	0.957	0.2	.	.	0	.	.	.
695	0	0	13	20	24	8	2	118	202	25	68	8	2	22	118	.	12	4	0.706	-1.3	6	2	0	.	.	.
696	1500	1	5	0	21	9	12	137	47	30	100	8	6	22	0.9	.	.	4	.	.	.	.	2	.	.	.
697	0	0	1	2	30	9	6	345	229	44	264	9	5	18	0.9	.	.	2	.	.	.	.	2	.	.	.
698	1000	1	0	0	21	9	10	147	125	27	95	8	5	10	0.9	.	.	5	.	.	.	.	2	.	.	.
699	0	0	0	10	27	12	3	.	.	.	.	8	3	20	42	79	34	5	.	.	5	2	0	.	.	.
700	1000	2	1	0	20	8	16	183	168	27	124	8	9	11	222	78	17	4	.	.	6	3	0	.	.	.
701	0	0	4	0	22	12	3	123	116	29	74	8	3	20	0.9	.	.	5	.	.	.	.	2	.	.	.
702	1500	1	1	0	19	10	12	137	135	35	74	8	8	17	0.9	.	.	4	.	.	.	.	2	.	.	.
703	1000	0.3	0	0	.	7	29	.	.	.	.	7	6	12	0.9	.	.	4	.	.	.	.	2	.	.	.
704	1000	0.5	0	0	19	7	14	185	135	29	114	9	8	17	0.9	.	.	4	.	.	.	.	2	.	.	.
705	0	0	1	7	36	14	2	216	214	39	134	9	6	29	87	89	29	5	.	.	1	0	0	.	.	.
706	0	0	2	0	20	10	3	.	.	.	.	10	5	24	66	.	49	4	.	.	.	.	2	.	.	.
707	0	0	0	0	20	9	2	168	114	39	110	8	5	22	0.9	.	.	4	.	.	6	3	0	.	.	.
708	0	0	10	12	26	10	5	.	.	.	.	7	4	20	1169	182	40	4	.	.	2	1	0	.	.	.
709	0	0	5	10	22	12	2	416	796	44	226	9	4	23	255	.	15	4	.	.	2	1	0	.	.	.
710	0	0	0	0	.	11	6	110	67	40	67	8	6	15	1022	.	.	5	.	.	6	3	0	.	.	.